Bell Telephone

Fifty Millionth Telephone Installed in White House
CLEO F. CRAIG

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DONALD S. BRIDGMAN

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BRUCE E. OSGOOD

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Towers and Beams: A PICTURE STORY

DB Rampant on a Field of Azure
HAROLD R. HUNTLEY

Functions of the Safety Engineer in Industry
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A Medium of Suggestion & A Record of Progress

JUDSON S. BRADLEY, *Editor. Published four times a year for the supervisory forces of the Bell System by the Public Relations Department of the*
AMERICAN TELEPHONE AND TELEGRAPH CO., *195 Broadway, New York 7, N. Y.*
CLEO F. CRAIG, *President;* S. WHITNEY LANDON, *Sec.;* JOHN J. SCANLON, *Treas.*

Who's Who & What's What

in This Issue

A YEAR AND A HALF AGO, in discussing the A. T. & T. executive group in the issue for Summer 1952, this MAGAZINE said of PRESIDENT CLEO F. CRAIG: "Since July of 1951, Mr. Craig has been President of the American Telephone and Telegraph Company. His Bell System career, beginning in 1913, illustrates how broad may be a man's experience within the corporate confines of one or two companies. For his assignments in the Long Lines Department took him from St. Louis to Kansas City and Atlanta en route to New York, and to such diverse posts as district plant chief, plant accountant, and construction supervisor, among others—with a six-year interval as a special representative in the A. T. & T. General Department—before he became General Manager of Long Lines in 1933. He was elected Vice President in charge of the Long Lines Department in 1940, and the following year moved to A. T. & T. headquarters. There his vice-presidential responsibilities included, in turn, charge of the Departments concerned with Personnel Relations, Operation and Engineering, and Finance and Revenue Requirements." At the beginning of 1954, that still seems appropriate as a brief statement.

THE BELL SYSTEM career of DONALD S. BRIDGMAN was recounted in these pages for Summer 1953, to which he contributed "Bell System Employment for College Graduates." His present article is based not only on correspondence with Mr. E. D. Wise in Turkey but on his two-way experience in recent years in helping to make our government's program of technical assistance for foreign countries effective. For his Personnel Relations responsibilities have included helping to arrange for the reception of foreign visitors by Bell System companies and for interested and qualified telephone people to undertake periods of foreign service.

The mutually broadening experience of the Turkish engineers and the Michigan Bell Telephone Company, as related by

Cleo F. Craig

Donald S. Bridgman

Bruce E. Osgood

John M. Shaw

Harold R. Huntley

William V. Kahler

BRUCE E. OSGOOD, shows the opposite face of the coin. From 1927, when Mr. Osgood joined the Commercial Department of the company, to 1950, he served in various sales and supervisory capacities—and for two years during World War II was with the Bell System Communications Committee in Washington. In the latter year he transferred to the Personnel Relations Department as supervisor of general personnel activities. As may be deduced from his tale, he was in general charge of arrangements for the visiting engineers.

VARIED RESPONSIBILITIES and a varied career have fitted JOHN M. SHAW for such a special assignment as the one represented in this issue. Born in Scotland, he came to this country as a boy, and was employed both in retail business and in several public utilities before joining the then Information Department of A. T. & T. in 1930. He subsequently served the Chesapeake and Potomac Telephone Company as information manager and the New York Telephone Company as an assistant vice president in the Public Relations Department before he returned to the A. T. & T.'s Public Relations organization in 1944. Here, as assistant vice president, he has charge of the company's radio, motion picture, open house, and public lecture and exhibit activities. His most recent previous contribution to this MAGAZINE was "The Blackboard Comes to Life," in the Spring 1945 issue.

AS AN ARTICULATE transmission engineer with a twinkle in his eye, HAROLD R. HUNTLEY belies his own remarks about the inability of the clan to communicate with others. Joining the Wisconsin Telephone Company in 1917, as transmission and protection man, he took a year out to complete work for his B.S. degree, returned to the company in 1921, and subsequently became transmission and protection engineer and, in 1928, transmission engineer. In 1930 he moved to New York and A. T. & T., where he was an O. & E. group head in the plant engineering division, and later in charge of groups handling electrical coordination and toll transmission. For three years he has held the position of transmission engineer. He is a Fellow of the A.I.E.E. and a Senior Member of the I.R.E.

THE MEETING of the American Society of Safety Engineers which PRESIDENT WILLIAM V. KAHLER of the Illinois Bell Telephone Company addressed in Chicago last Fall was held in conjunction with the meeting of the National Safety Council.

(*Continued on page 248*)

THE FIFTY MILLIONTH TELEPHONE

IN SERVICE IN THE NATION

PRESENTED TO THE PRESIDENT OF THE UNITED STATES

DWIGHT D. EISENHOWER

NOVEMBER 18, 1953

Mr. Craig Discusses Significance of Historic Event as Bell System and Independent Telephone Industry Join to Present Symbolic Instrument to President Eisenhower

Fifty Millionth Telephone Installed in White House

Cleo F. Craig

Editor's note: *The fifty millionth telephone placed in service in this country was presented to Dwight D. Eisenhower, President of the United States, on Wednesday morning, November 18, in the White House. Presentation was by Cleo F. Craig, President of American Telephone and Telegraph Company, representing the Bell System companies, and Warren B. Clay, President of the United States Independent Telephone Association, representing nearly 5300 independently-owned telephone companies. A commemorative scroll which they also presented to Mr. Eisenhower is reproduced on the next page. They were accompanied to the White House by Rosel H. Hyde, Chairman of the Federal Communications Commission, and C. L. Doherty, President of the National Association of Railroad and Utilities Commissioners. A dinner held that evening in a Washington hotel to signalize the event, and attended by representatives of the government, the armed forces, and the telephone industry, was addressed by Mr. Craig, Mr. Clay, and Postmaster General Arthur E. Summerfield. Mr. Craig's remarks follow:*

THERE ARE a lot of reasons why we telephone people are happy to be here tonight.

But speaking for us in the Bell System, I'd like to say first to our associates and friends of the Independent telephone companies that one of the things we like the very best is this chance to be together with you.

We are pleased no end—as co-authors, so to speak, of the telephone story—to take part with you in marking our joint achievement.

We are also delighted to join with you in extending the warmest possible welcome to our guests from government and the armed services and all who share our deep interest in telephone progress.

My thoughts on this occasion are quite simple.

President Eisenhower's acceptance this morning of the fifty millionth telephone was a gracious and inspiring recognition of the part we play in the life of the nation. The President has done us great honor. He has also given us, I think, new cause

Fifty Millionth Telephone

This, the fifty-millionth telephone to serve our country, is presented by the nation's telephone industry to

The President of the United States
Dwight D. Eisenhower

Telephone service was born in America. Here in the climate of freedom it has been most widely developed and used. In ever increasing measure it has contributed to the unity, strength and progress of the nation. This instrument, serving our Chief Executive and Commander-in-Chief, symbolizes the constant effort of telephone people to provide this country with the best telephone service in the world.

As representatives of telephone men and women throughout the United States, we pledge anew the determination of all to serve the nation, in peace and war, to the utmost of our ability.

November 18, 1953

President
American Telephone & Telegraph Company

President
United States Independent Telephone Association

This handsomely engrossed scroll, signed by Messrs. Craig and Clay, accompanied the telephone they presented to President Eisenhower on November 18, 1953

to weigh our opportunities and our responsibilities.

Let me recall to your minds something the President said on another occasion. I think the connection will be clear.

In his Inaugural Address last January, he observed that the strength of all free peoples lies in their unity. And he went on to say, "To produce this unity, to meet the challenge of our time, destiny has laid on our country the responsibility of the free world's leadership."

Those words give expression to a compelling fact. We in this country are face to face with the plain truth that the responsibility of leadership is ours. We could not escape it even if we wanted to.

Mr. Craig points out to Mr. Eisenhower a feature of the presentation telephone

What does this mean to us who provide America's telephone service?

To my notion, it means that a very considerable share of the responsibility the President speaks of rests on us. The nation's capacity for leadership in the free world begins with unity at home. If Americans are to come together and work together with greatest effectiveness, they must be just as free as possible to talk with each other. They must learn from each other, think with each other, plan with each other, grow with each other. They must communicate. And they must be able to do so with complete ease and freedom, wherever they are and whatever their need.

Of course I am not saying that the telephone by itself can create unity. But it certainly can and must nourish and feed it and aid and abet it. It can and must help it to flourish and grow. In this day and age, the telephone is indispensable to the unity and progress of our country, and no one knows what great things may have their beginnings in the way we do our job.

Another thought:

This country leads the world in telephone service because we have never let up in our efforts to find a better way. We wouldn't be serving fifty million telephones today if we were still limited to the methods and means of the past. The quality of service wouldn't attract that many customers, the cost would be too high, and even if these things were not true we couldn't find enough people to do the job.

Furthermore—and this is what I want to emphasize—the very progress we are celebrating, and the changes we set in motion, affect us fully as much as they affect anyone else.

FOR INSTANCE, we make it possible for industry and the armed forces to coördinate their operations on a broader and broader scale—and then what happens? They promptly ask us for services that require us to coordinate our own work more than ever before.

Again, telephone progress has greatly expanded the local service areas where subscribers have a close community of interest. And again the result, in more and more places, is to bring Independent and Bell companies into the closest possible association in providing the local service.

In such ways, and notably also in the spread of long distance dialing, the advances we are making directly influence ourselves. Nor is this to be wondered at. We can hardly expect to bring the nation closer and closer together without the same thing happening in our own back yard. The happy fact is that there is now more down-to-earth, day-to-day working together throughout the entire telephone industry than there ever was before. Nothing but good can come of this, and in any event there is just no other way to get on with the job.

All I want to say on this point can be summed up in a few words. First, we of the Bell System are tremendously glad that you people of the Independent telephone companies are just the people you are. We're glad it's you we are working with. Second, let's keep it in mind that the continuing progress of the business always creates a lot more good than it creates problems. If that were not so, none of us would be here tonight.

In conclusion, I hope profoundly that none of us will ever forget the true nature of the service we render.

It is human—living—personal—friendly.

It is something we do for the family next door and for the business down the street.

THE REAL MEANING of fifty million telephones is not in their total number but in the people we bring together in every community in the land. The secret of our success in serving others is not in the machines we use but in the ways we choose to use them. We have always used machines. As we use them more and more in the years ahead, we must be diligent to make sure that our human spirit of service is fully maintained and always shines forth strong and clear.

You will remember another thought that President Eisenhower expressed in the speech I have already quoted. He said, "Whatever America hopes

to bring to pass in the world must first come to pass in the heart of America."

I submit also that whatever we of the telephone industry hope to bring to pass in our country must first come to pass in the hearts of telephone people.

We can only make a nation of neighbors by being good neighbors ourselves—good neighbors to everyone we serve, in every community and corner of the land. That is the way, and the only way, for us to keep on increasing our contribution to the unity of our country, the strength of the free peoples, and the hope of peace in the world.

Fifty Million Telephones

AMERICA is the birthplace of the telephone. In 1878, only two years after making his invention, the youthful Alexander Graham Bell wrote: "I believe in the future, wires will unite different cities, and a man in one part of the country may communicate by word of mouth with another in a distant place."

But even Mr. Bell's broad vision did not fully encompass how widely his invention would be developed and used. By the turn of the century there were one million telephones in the United States, by 1929 there were 20 million, by 1946 there were 30 million. Expansion during the post-war years has been greater than during any other time. In the years 1946–53, 20 million telephones were added to the system.

With more telephones than the rest of the world combined, Americans now make, on an average day, more than 178 million local calls and six and a half million toll and long-distance calls. Conquering the barriers of time and distance, the telephone has made a neighborhood of the nation, linking cities, towns, farms, offices and homes across the length and breadth of the land. It has quickened the pace of our accomplishments, and has contributed in increasing measure to the nation's strength, security, and progress.

The product of many, many minds, the telephone system exists through the joint endeavors of 21 Bell System telephone companies and nearly 5,300 independently-owned telephone companies. More than two million Americans either share ownership in the business or are engaged in telephone work.

Serving the nation's Chief Executive and Commander-in-Chief, the fifty millionth telephone symbolizes the constant effort of the industry to provide the United States with the best telephone service in the world.

For Nearly Three Years, Former Telephone Executives Have Implemented the Objectives of the Goverment's Foreign Operations Administration on the Bosphorus

Bell System Helps Turks to Modernize Telephones

Donald S. Bridgman

ON APRIL 23, 1951, a team of five recently retired Bell System men and two others on leave of absence from Bell operating companies, all with long administrative or engineering experience, left New York for Turkey by air. Their purpose was to assist the Turkish Ministry of Communications in the rehabilitation and development of that country's telephone system. Today, nearly three years later, seven former Bell System men are still carrying on this work in Turkey. All are retired, and two were in the original group.

This unique contribution of Bell telephone men to this country's technical assistance program abroad was initiated in the fall of 1950, when the Turkish Economic Mission here asked the American Telephone and Telegraph Company for assistance in the proposed program. As the result of subsequent discussions with the chairman of that mission and representatives of our government's Economic Coöperation Administration (now the Foreign Operations Administration), A. T. & T. agreed to undertake to find highly qualified Bell System men who would volunteer for the work in Turkey.

In addition, the Michigan Bell Telephone Company later undertook to carry out the second part of the program through providing, on a cost basis, an appropriate training program for ten Turkish engineers in various aspects of telephone work here.

The entire project has been conducted as part of our government's technical assistance to friendly nations under the Marshall Plan and Mutual Security Program, now administered by the Foreign Operations Administration.

"A Fine Example of Coöperation"

The Turkish telecommunications project is a fine example of how the United States shares its technical know-how with other nations of the free world. The work accomplished is also a fine example of coöperation between government and private industry. Acting as a team, government and industry have contributed materially, not only to the economic strength, but also to the security, of Turkey. Because the security of the United States is inseparable from that of other free nations, this effort has added to the strength and security of our own nation and our own people.

HAROLD E. STASSEN
Director, Foreign Operations Administration

Pressing Need for Rehabilitation of the Telephone Service

THE GREAT IMPORTANCE of this project was immediately recognized. At that time, the population of Turkey was about twenty million. Its territory contains great natural resources, and is in an extremely strategic location. Turkey, moreover, is the only nation throughout history in which a democratic form of government has been established through peaceful election immediately following a military dictatorship. Its people are strongly anti-communist and their fighting qualities were again demonstrated by the magnificent performance of their troops in Korea.

In recent years, Turkey has made notable economic progress, and can look forward to still further development. Its telephone system, however, was wholly inadequate. Originally built and operated by the British, it had been taken over by the Turkish government 15 years earlier. There were only about 60,000 telephones, or approximately one-third of a telephone per 100 population statistically speaking—as compared to 28 per 100 population in the United States. Two-thirds of these telephones, moreover, were in Istanbul and Ankara, and many villages and towns were wholly without telephone service.

The toll network covered the country reasonably well, but most pole lines carried only a single pair of wires. The only possible connection with the outside world was through a 3-channel carrier circuit to Sofia, Bulgaria; but because of political and maintenance difficulties this link was of little value. In Ankara alone there were eight different types of telephone equipment in use, and four types of carrier equipment were employed on the single toll route between Ankara and Istanbul.

The service was extremely expensive: a new installation cost about a hundred dollars, including advance payment for a few months, and toll rates were about sixteen times those in the United States. Despite this

A portrait of the late Kemal Ataturk, father of modern Turkey, hangs behind the former Director General of Posts, Telephone, and Telegraph Administration in Ankara as he and Mr. E. D. Wise met to discuss affairs through the young woman interpreter

fact, there was a large unfilled demand for service, particularly in the major cities of Istanbul and Ankara. Both from the point of view of economic development of the country and from that of potential military requirements, strengthening and expansion of the telephone system seemed essential.

The first major step in the selection of the initial team to go to Turkey was taken when Earl D. Wise, who had just retired as vice president and general manager of the Pacific Telephone and Telegraph Company's Washington-Idaho Area with over 40 years' service, volunteered to act as its coördinator and was accepted

in this capacity by the Turkish Mission and E.C.A. Early in 1951, Mr. Wise flew to Turkey to obtain first-hand knowledge of the problems to be encountered and the types of men most urgently needed. On his return, he interviewed telephone men in all parts of the country who were interested in the project and were suggested by their companies.

Before taking off, late in April, the men selected spent a week in Washington securing invaluable information about the technical assistance program and about Turkey. The group, with their assignments in Turkey, were as follows:

E. D. Wise, vice president, Pacific company: coördination and general relations with the Turkish Posts, Telephone, & Telegraph Administration.

E. C. Balch, chief engineer, Michigan Bell Telephone Company: general and equipment engineering.

J. E. Mannocci, assistant vice president, Pacific company: traffic operations.

A. F. Wilson, assistant vice president, Ohio Bell Telephone Company: commercial operations.

V. E. Tyson, supervisor of supplies and motor vehicles, New England Telephone and Telegraph Company: equipment maintenance, apparatus repair and distribution.

L. J. Simonich, plant extension engineering, Illinois Bell Telephone Company: outside plant engineering.

W. E. Badden, division construction superintendent, Michigan company: outside plant construction and maintenance.

Because of the nature of their assignments, the last two men listed were active employees on leave. Of the others, two retired in order to participate in this project.

Most of the men in this first group remained a year or eighteen months; but Mr. Wise and Mr. Mannocci have stayed on continuously, and A. D. Lewis, retired division commercial superintendent of the Indiana company, arrived in the fall of 1951 to take up the commercial operations work. A year later, however, only these three men remained in Turkey, primarily because of a curtailed Turkish budget for the project. Its importance was recognized once again, however, for the budget year

Miss Vera K. Hearn, American secretary to the staff, discusses telephone directives with Mrs. Guzin Baytin and Mrs. Honul Manioglu, translators and interpreters

beginning last March, and Mr. Wise returned to this country two months earlier to secure qualified men for additional assignments.

Recruits and Replacements

THIS NEW GROUP took off with him on March 19 and 20, and included the following men for the assignments shown. One had already retired; the others applied for retirement in order to undertake this work.

Messrs. J. E. Mannocci and A. D. Lewis accompany Mr. Necdet Teney as he inspects an information desk in Ankara. Below: These overseas radiotelephone positions now afford connection between Turkey and many parts of the world

Glen Gardiner, outside plant engineer, Northern California area, Pacific company: outside plant engineering.

R. W. Deardorff, transmission and protection engineer, Oregon area, Pacific company: transmission engineering.

T. M. Libby, transmission engineering, Washington-Idaho area, Pacific company: carrier and radio engineering.

H. A. South, division construction superintendent, Southwestern Bell Telephone Company: outside plant construction.

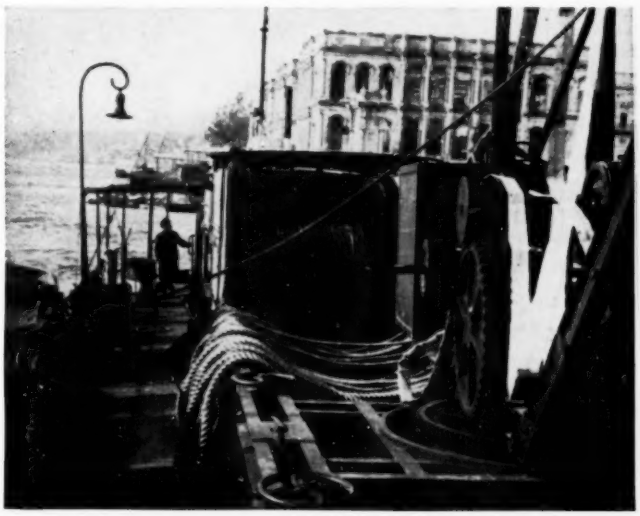
In the opinion of the Bell System men, there have been three other real members of this team.

One, who joined the first group soon after its arrival and remained until her return to the United States in the summer of 1953, was Miss Vera K. Hearn, its American secretary, provided by the F.O.A. Miss Hearn's father owned and operated the telephone company in Grove Hill, Alabama, for many years, where she gained knowledge used not only in her regular duties but in helping to train the operators for the Ankara-New York radio telephone circuit opened early in 1953. As a result, the operators have developed not only efficiency but a slight southern accent in passing their calls.

Two Turkish young women, Mrs. Guzin Baytin and Mrs. Gonul Manioglu, acting as interpreters and translators, have been most pleasant to work with, and through their knowledge of Turkish customs have kept the group out of trouble many

times. On rare occasions when misunderstanding developed between Turkish officials and members of the advisory group, it is suspected that the interpreting was more diplomatic than literal.

There have been, of course, a number of obstacles to overcome in developing effective cooperation between the consulting group and the Turkish telephone management and in quickly bringing about major improvements in the telephone system. One of these, obviously, is the difference in language—which makes it difficult for the consultants to get their ideas across and for the Turks to secure full understanding of their problems. The Turks, too, are a sensitive people, justifiably proud of their history and achievements. Such a people cannot be expected to accept advice given in a critical spirit.



Cables provide new voice paths beneath the historic Bosphorus. Below: The Turkish P. T. T. now handles the laying of its submarine cables

Such difficulties have been resolved, in large measure, by mutual respect, patience, and close "on the job" association, which have brought about an excellent relationship that is now working very well. One striking illustration of this real achievement occurred at a dinner given some months ago for the new Turkish Minister of Communications and attended by a number of the ranking officials of the telephone division and the American consultants. This Minister is responsible for the railroads, seaways, and airways, as well as the postal, telephone, and telegraph systems. At the dinner, the new Minister welcomed the attendance of the foreign-

Mr. H. A. South, expert in outside plant construction, assisted an American agricultural mission by devising this efficient apparatus for stacking hay. And when (right) a crucial rope broke, he volunteered to go aloft and execute repairs

ers who were assisting in the development of the telephone system. The Director General of the Posts, Telephone, and Telegraph Administration, in responding, paid Mr. Wise particularly the high compliment of calling him not a foreigner but at least half Turk.

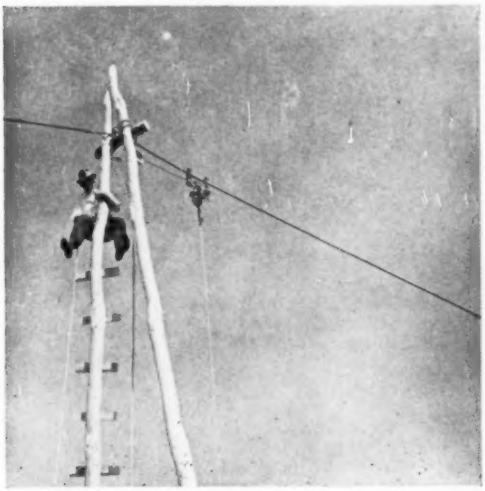
Administrative Problems

ANOTHER serious obstacle to progress, recognized by the Turkish P.T.T. administration as well as the consultants, has been the fact that the communications system has been operated as a government bureau, with its revenue going directly into general government funds and its expenditures coming directly from them. In addition, a 1943 law spelled out the number of employees in the P.T.T. by occupation and location and their rates of pay. These rates, moreover, were below those paid not only in business but in other government operations.

However, a new law, which had been pending about two years, was passed in July, 1953, and went into effect in October. It establishes the P.T.T. system as a government-owned industrial enterprise, under a Board of Directors, with much greater financial and operating independence. It is now probable that a functional organization will be set up and that, after the readjustment period, far greater progress can be made.

Nevertheless, there have been solid accomplishments in the Turkish telephone system during the past two or three years. On Jan. 1, 1951, the number of telephones in service was 65,000; two years later this number was 97,000—a gain of about 50 percent; and, as new facilities have become available this year, the rate of gain is even larger. The annual rate of gain in local traffic has been about 20 percent, and that in toll traffic over 30 percent. Construction of new buildings has been particularly active in the Istanbul area, where six buildings were completed in 1952. Teletypewriter service, first provided in 1951, has grown steadily, and in 1952 plans were adopted to expand it further and establish teletypewriter exchanges in Ankara, Istanbul, Adana, and Izmir.

The demand for service continues to outstrip available facilities, and at the end of 1952 held orders were



A recent newspaper article by Arnold Toynbee, the historian, points out that in the ten years from 1919–28, Turkey "underwent, simultaneously, experiences equivalent to our Renaissance, Reformation, Scientific Revolution, Industrial Revolution, and French Revolution, all rolled into one." Since that period, the article continues, they have held a genuinely free election and today even the peasants, in the long run the decisive element in the Turkish population, are making genuine economic and social progress.

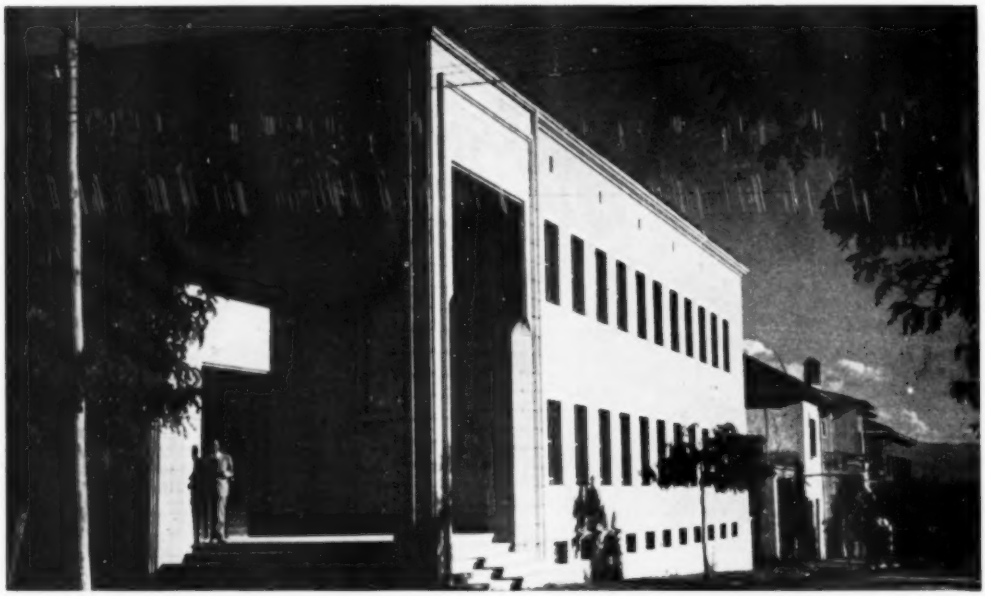
about 35 percent of working main-line telephones. Definite steps to relieve the situation have been taken, and their effects are becoming apparent this year. A major construction program is essential to meet the long-term domestic demand for telephone service, however, and plans have been drawn up for this purpose. In addition to scheduled installations of new facilities in the Istanbul, Ankara, and Izmir areas, these plans include projects for new plant at a number of other towns and the installation of point-to-point radio to supplement the wire network, particularly in mountainous and sparsely settled eastern Turkey.

During this period, the expansion of Turkish communication facilities to other countries has been particularly notable. The first addition to the single outside link to Bulgaria was the completion of a wire line to Greece in 1951 and the addition of carrier on this route early in 1952. In this way, connections can now be set up through Greece to all parts of Europe. To the east, three-channel carrier systems to Syria, Iran, and Irak are in operation.

On February 16, 1953, radio telephone service between New York and Ankara was established. At different hours of the day, the same equipment is used for service to Berne, Switzerland, and Hamburg, Germany, with connections to other parts of Europe, and to London for service to Great Britain and Ireland.

Since this project was undertaken, Turkey has become a member of the North Atlantic Treaty Organization and the improvement of its domestic telephone system and of its communications to the Western World have become increasingly important to the defense of all free nations.

Some of the fields to which the Bell System consultants have given special attention are: long-range programming of central-office expansion in the larger cities, plans for specific buildings, studies of the trunking layout in Istanbul, introduction of written operating practices, forecasts of demands for service, revision of toll rate schedules, and directory prac-



Modern telephone buildings are rising in many Turkish cities. This one is in Elaziz

tices. Inspection trips to all parts of the country have been made, with resulting specific suggestions.

Domestic Arrangements

WITH one or two exceptions, the wives of the Bell System men have accompanied or followed them, and in a few instances, other members of their families have done so. At first, the group was located in Istanbul (long famous as Constantinople), a beautiful city with many ancient mosques and other points of architectural and historic interest. Many hours were spent exploring in the city and riding back and forth on the little ferry boats that go up the Bosphorus almost to the Black Sea, with stops at little commuting settlements along the water's edge.

Now the entire group is at Ankara, 300 miles east of Istanbul on a 3,000 foot plateau, established as the capital of the Republic by Kemal Ataturk soon after World War I. Its main street is lined with modern buildings, is very well lighted, and contains a center parkway with beautiful trees and flower beds surrounding numerous statues. In the adjoining hill city of Angora, the people live in most picturesque style as they have for many centuries. Nearby are other points of unusual historic interest, and throughout Turkey new evidence of ancient civilizations constantly is being found.

Living conditions in Istanbul and Ankara are similar to those in many European cities. Some members of the group live in individual houses, others in apartments. Local transportation is excellent. Experience in shopping, with its characteristic bargaining, leads to increased skill and real enjoyment. Villagers coming

into the city to sell their produce in the markets and to purchase supplies provide a most colorful sight. Particularly impressive for the Bell System group has been the unfailing politeness and friendliness of the Turkish people, and there is ample evidence that the members of the group have won their regard—and liking as well.

For the future, perhaps the most significant fact is that the ten Turkish engineers trained in the Michigan Company in 1951–2 have been placed on assignments where that training can be effectively utilized, and for the past year and a half have been working closely with Bell System men of long experience on the problems of the Turkish telephone system, typical not only of today but of tomorrow. As a result, this group will continue to apply the best in our methods after the consultants return home to the United States, and will become an effective link to other Turkish telephone men who will carry on similar methods over the years.

Helping Turkish Telephone Men to Greater Skills

Bruce E. Osgood

WHEN SEVEN TELEPHONE EXPERTS from the United States went to Turkey, early in 1951, they found that one of the greatest needs there was for more trained telephone technicians. They coöperated, therefore, in selecting ten young Turkish engineers to come to the United States for specialized training. This group arrived in New York on August 2, 1951, en route to Detroit.

The Michigan Bell Telephone Company was selected to carry out the Turkish training program because it had an interdepartmental training program for new employees entering the supervisory ranks and because it serves a great number of widely scattered small communities and thus meets many problems comparable to those which the Turkish engineers encounter in their own country.

Ten Turkish engineers arrive in this country on August 2, 1951. The authors of these articles, Messrs. Bridgman and Osgood, are the first two at the bottom of the gangway

Some interesting problems presented themselves soon after the training got under way. Uppermost in importance was the "language difficulty," as the Turks so aptly put it. A method had to be devised to encourage the Michigan Bell instructors to adjust their speaking tempo and "slanguage" to meet the needs of the Turkish engineers; for it became obvious that the innate courtesy of the Turk prevented him from asking clarification questions of his instructors for fear of insulting them. A method also had to be worked out to make regular quality appraisals of the training being given.

An intensive after-hour program was continued for the entire period of interdepartmental training, and even though it required long hours and hard work on the part of the Turks, as well as those administering the program, it contributed greatly to the ability of the administrators to analyze and adjust the subsequent training program. It is recognized that a schoolroom approach, such as this, worked a considerable hardship on the visitors, but we could find no other way to make an accurate and comprehensive appraisal of quality and understanding of the training program as it progressed.

Three of the visitors from the Bosphorus observe overseas and ship-to-shore operations

Technical subjects were covered in the latter part of the program, when the ability of the men to understand spoken English was better developed. Delaying the presentation of technical subjects until later provided time to introduce the men to telephone terminology during the evening sessions. As a result, when they began studying in the general engineering and plant departments, they were more familiar with American telephone operation and telephone lingo in general, and it is believed a much more effective understanding of these vital operations was accomplished.

The six months' training program, as originally planned, was divided into three parts, each of two months' duration.

The first part consisted of the two months' interdepartmental training program. This included a quick over-all orientation of all departments and phases of the telephone business in Michigan.

The second part included a concentrated two months' training program in these three major areas of telephone plant and engineering work:

Outside plant engineering, construction, and maintenance.

Toll line maintenance, transmission and protection engineering, radio communications.

Traffic engineering, building and equipment engineering, central office maintenance.

Part three included two months of individual assignments for all ten engineers in the operating departments. In this phase it was intended that each man would be placed on individual work assignments similar to those

Another trio appears on a television program

which he was expected to perform when he returned to Turkey.

Revising the Curriculum

BEFORE the training entered the second phase, experience indicated that it would be advisable to make some minor adjustments and improvements in the program. So the second and third parts of the program were partially combined. Some of the delegates were placed on individual assignments and others were given group assignments. Since trained telephone personnel was needed most urgently in Turkey in plant, engineering, traffic, and commercial phases of the business, these activities received the most emphasis. The training objective was to send back to Turkey as well rounded a team as possible, representing those key phases of the telephone business.

Nusret Ercil, Hayrettin Pakel, and Rifat Toplu were assigned to study outside plant construction and engineering. Vehbi Basar specialized in traffic engineering. Huseyin Cavuslar and Omer Sevkal studied central-office equipment engineering and maintenance. Cezmi Saglam studied carrier equipment engineering and maintenance. Necmi Ozgur studied commercial engineering and business office operation and was given a quick look at Revenue Accounting. Adnan Bayboru and Turhan Zirh were given somewhat more general training.

All of the specialized training was given at various locations in the Michigan company area except for the following: one week at the Chicago plant of the Automatic Electric Company; one day at the Murray Hill unit of the Bell Telephone Laboratories; one day at the New Jersey plant and laboratories of the Federal Telephone and Radio Corporation; one day at the Kearny plant of the Western Electric Company; one day in the Long Lines Department of the American Telephone and Telegraph Company in New York; and two days at the Spartanburg, South Carolina, pole treating plant of the Taylor-Colquitt Company.

The entire group pauses at the telephone exhibit at the Museum of Science and Industry in Chicago

From the first day after the arrival of the Turks, life for them and for those who came in contact with them was a rich and never-to-be-forgotten experience. On the very first day in New York, a woman approached our red-headed Turkish engi-

neer, Turhan Zirh, and asked him the location of the subway entrance. He pointed to the one we had just walked by and she quickly said, "Thanks, I'm a stranger in town."

We were told that it was proper, when introducing our Turkish friends to people, to use their first names and add *Bey* on the end: Turhan Bey, Adnan Bey, etc. The first time we did this, one of our officials remarked, after he had been introduced to several of them, "Oh! I didn't know you were all brothers."

Back home again, two of the Turkish engineers (left and second from right) join with three of the Americans and with other Turks at a new repeater hut near Ankara

Turhan Zirh had another first when, after a few days, he came in one morning and said, "Now I am an American." Noting the inquiring expressions, he added quickly, "Last night for the first time everyone in my dreams spoke English to me."

Helping Us Understand Turkey

THE TURKS did an outstanding job of trying to help America to understand more about their country. They made many luncheon talks. They were interviewed by many newspaper writers. They appeared on two television programs, once for 45 minutes and once for 15 minutes. In fact, they were trying so hard always to speak English that one of them, while rehearsing for one of the television programs, was asked to repeat in Turkish what he had just said in English and was so taken by surprise that he had to ask one of his countrymen to help him do it. Later he said he had got his mind functioning so much in English that he found it difficult to translate English to Turkish.

The Turks were quite surprised to learn that we have a "slight" variation in language in different parts of our country. After their meeting with Mr. Craig, President of A. T. & T., and Mr. Dumas, executive vice president, and formerly President of Southern Bell Telephone Company, they were eager to know what part of the country Mr. Dumas came from. One of them said, "His speech was so smooth and so soft but I

had to pay attention closely to understand him."

At work and at play the Turks made every minute of their time do double duty. They applied themselves diligently to learn everything they would need when they got home. They cemented relationships with many Americans. The effect of that good will they have left behind will be multiplied many fold in the future. They have done much to bring two friendly republics closer together with increased mutual understanding and admiration one for the other.

At the end of the six months' training period our Turkish friends turned their faces toward the East and home. They were filled with enthusiasm and high hopes for utilizing the experience gained with Michigan Bell. They were fully cognizant of their country's needs for better communications, and were restless to return and put into operation all their plans and dreams for the future.

Before the visitors returned to Turkey, early in 1952, they met with Mr. Cleo F. Craig (left), President of the American Telephone and Telegraph Company, in New York

A Discussion of the "Social Responsibility" of the Bell System High-Lights the Contributions which the System Has Made to Our Country and Its People

People As Telephone Users, Workers, and Investors

John M. Shaw

Note: Not long ago an eminent sociologist came to the American Telephone and Telegraph Company and said, in effect: "I am working on a series of lectures on the social responsibility of American business. My research so far has brought me into contact with a great many students of the subject, and the Bell System is one of the business enterprises most frequently mentioned as having very special obligations in the public service. I'd like to have your own ideas about your social responsibility and how you go about meeting it."

The job of answering this all-encompassing question was assigned to John M. Shaw, Assistant Vice President, A. T. & T. Company. He prepared some informal notes as a guide to his discussion. We asked him to recast them in a form suitable for publication. EDITOR.

TO GET the right perspective of the Bell System's "social responsibility," and how it is being met, it may be helpful to high-spot the job it has done for the American public over the long years of its history. And this review may be better understood if we think of the public in terms of (1) the people who use the telephone, (2) the people who give the service, and (3) the people who invest their savings in the business. All these people are members of the American public.

The People Who Use the Telephone

FROM one "toy" telephone, the Bell System has developed a machine that has changed for the better the entire scheme of life in America. Its ally in this progress has been the large group of independent telephone companies that connect but do not compete with Bell System lines.

The telephone is now universally used.

It has made family life more com-

fortable and secure, and two American homes in every three are now telephone-equipped.

By expanding the range and increasing the speed of communication, the telephone industry has stimulated the processes of every other institution that serves the people, be it industrial, cultural, or governmental. The telephone's contribution to the American economy is incalculable.

The number of telephones in America has doubled in the last ten years. There are now in this country more telephones than in all the rest of the world combined: 50 million, four fifths of which are operated by the Bell System.

We are especially proud of the job that has been done in rural areas, where the costs of giving the service are high and the value of the telephone is not always fully recognized. More than two million telephones have been added by the Bell System in rural areas since the war, so that today in the 32 most prosperous states 60 per cent and more of the farms have telephones. Nothing in the world approaches this development.

To achieve this nation-wide growth, the Bell System has spent a billion dollars a year in new construction for the past eight years. Much of this money has been provided by members of the public willing to entrust their savings to those who administer the telephone business.

The service provided over this expanding system of telephone lines has been steadily improving. People can hear better over them. Calls are put through more quickly. The service is more dependable.

Four-fifths of all Bell telephones are now dial, and two-thirds of all long-distance calls are dialed by the operator. We are moving steadily

The people who use the telephone

toward the day when any telephone in America can be dialed direct from any other.

Meantime, the price of telephone service has been going down in terms of the ability of the people to pay for it. At a time when the cost-of-living generally has doubled, including the cost of operating the telephone business, telephone rates have gone up less than one third.

VAST contributions have been made by the Bell System to other communications services which resemble the telephone and to some extent have been the product of telephone research. These include radio, television, and the talking motion picture. The latest development of Bell System research that is likely to have a profound effect on all these activities is the transistor. Like the thousands of other telephone patents, the transistor is made available upon reasonable terms to anyone who wants to use it.

Much of the advance in telephony is due to the close working relationship between research, manufacturing, and operation. The research-manufacturing members of the Bell System team were called upon by the government during the last war to undertake no less than twelve hundred military projects, including radar, guided missiles, atomic energy, and many other devices having great significance for the preservation of the free world. This close and important relationship continues.

From the outset, the Bell System has operated without the aid of government subsidy—the device by which the public has so often found it necessary to encourage the development of enterprises of this kind, in this and other countries. On the contrary, Bell System services are not only self-supporting in our economy, but are actually making a contribution to the support of the government, through taxation, equal to about thirty per cent of all telephone revenues. The telephone users, in other words, are apparently willing to pay not only what it costs to provide them with telephone service, but thirty per cent more.

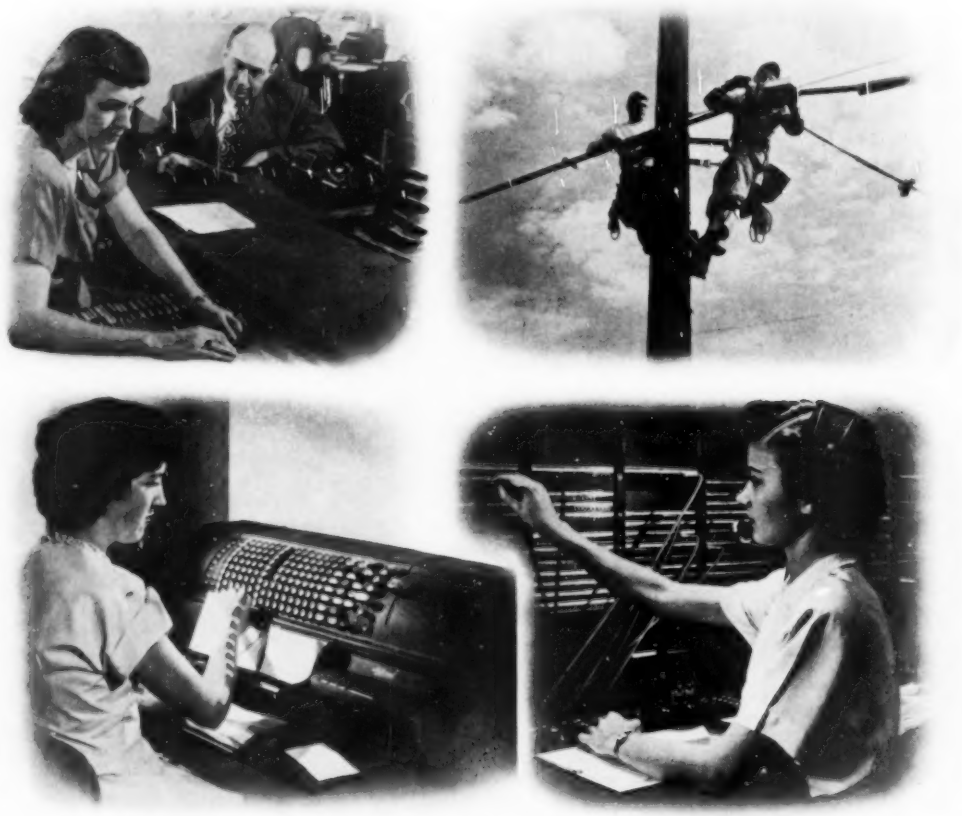
The American public has a very effective way of expressing its approval or disapproval of the business enterprises which serve it. It simply uses or declines to use the product or service made possible by the enterprise. By its generous use and demands, we think the American public itself has answered for us the question of how well the Bell System has met its social responsibility from the point of view of the telephone users.

The People Who Give the Service

THE BELL SYSTEM gives employment to some 700,000 people. Despite the rapid advance to dial operation, this is twice as many as were employed in 1929.

Telephone growth has also created many more jobs in other industries. The by-products of telephone research have created still more.

Telephone employment has a high degree of continuity, and the business is operated so as to make this possible. Technological improvements are introduced with full recognition that other jobs are to be found for all permanent employees affected,



The people who give the service

and for our success in this we have won praise in the highest quarters.

A serious strain on the Bell System's continuity of employment was experienced in the depression years of the 1930s. As telephones were disconnected, part-timing and made-work plans were introduced. Force losses resulted, not so much because employees were laid off as because new employees could not be hired for jobs that did not exist. Except for this relatively brief span of years, the number of jobs available in the Bell System has steadily increased as the System has grown.

Wages have kept pace with those paid for similar skills in the same community, wage rates having doubled since before the war. Working conditions have been steadily improved. It is always gratifying to hear the friendly and favorable comments of visitors to telephone buildings about the pleasant atmosphere of the offices and equipment rooms in which telephone people work.

Twenty-five years before the public made government social security compulsory, the Bell System had a benefit plan that included one of the

earliest and best pension systems in American industry.

Promotion from the ranks is a constant process, from the lowest job to the highest. Discrimination and nepotism are so frowned on by tradition that telephone companies have been singularly free from these evils.

That telephone companies are recognized as good places to work is borne out by the fact that employees hold on to their jobs and bring their friends and relatives into the business. The channel through which most new employees come into the telephone business is through other employees.

The figures of the U. S. Bureau of Labor Statistics show that turnover in the telephone industry is about one half that of all manufacturing industries.

If we believe—as our sociologist friend did—that part of the Bell System's social responsibility is to provide a place where members of the public can work constructively together and earn a living, then it would seem we are meeting it rather well.

The People Who Invest Their Savings

THE BELL SYSTEM is owned by the people who buy shares in the American Telephone and Telegraph Company. There are more than 1,250,000 of them, in all parts of America.

Regular dividends have been paid by AT&T for a great many years. There has never been an extra dividend nor has the stock been split. From the surplus built up in the prosperous years, it has been possible to maintain the dividend even in years when it was not fully earned.

The early years of the decade

The people who invest their savings

1925–1935 were good years, in which many industries made high profits and paid them out in cash and stock dividends and split the stock. AT&T paid its regular dividend and saved the rest. When the depression came, AT&T was able still to maintain its regular dividend by drawing on its surplus. In retrospect, it does not seem that we would have met our social responsibility for the long pull if we had cut that dividend, at the time of greatest need, and thus shaken the confidence of those who must be relied on to provide the tools without which no service could be given and no jobs provided.

Time has shown the wisdom of this consistent dividend policy, and the public has given its seal of approval in the most emphatic way, by providing more than six billion dollars of new capital since the war. More than half has been in the form of capital stock, so that the business has been able to go forward without accumulating a destructive load of debt.

If part of our social responsibility is to provide a place where people can put their savings to work productively and earn a reasonable return, it would seem that we are meeting it.

AS FOR THE FUTURE, we approach it with advantages that our predecessors did not have. Chief among these is their own example, which has given us a tradition of public service that guides our every action. Basic in that tradition is the recognition that we prosper only as we recognize what our friendly inquiring sociologist called our "social responsibility."

Placing of long distance calls by number has long been encouraged . . . for the customer's benefit as well as for the company's. The value of calling by number is well demonstrated by the following dialogue of an actual call placed in St. Louis a while back:

"I want to call my son."

"In what city is your son located?"

"Utah, Nevada."

"Are you sure that is Utah, Nevada? Utah and Nevada are names of states."

"I sure think so."

"What is your son's name?"

"Tommy Jones."

"Is the telephone listed under his name?"

"No, he's in a camp."

"What is the name of the camp?"

"Camp Marines."

"Do you know what company he is in or his rank?"

"No ma'am."

"How do you address his mail?"

"I just write U.S.M.C."

"Is he an officer?"

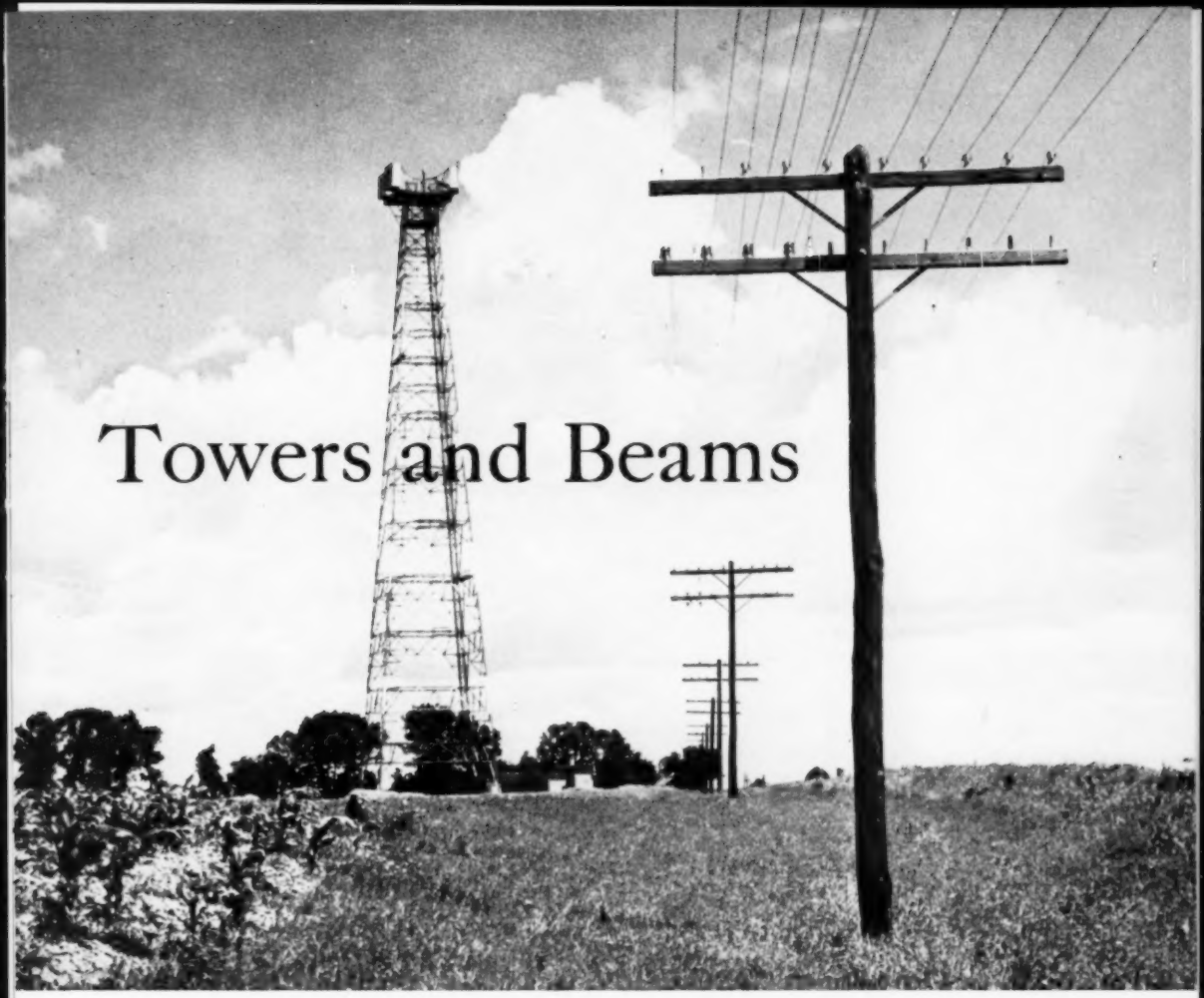
"I don't know, he might be a corporal or a sergeant by now."

"I'll try to locate him for you, ma'am, and call you back."

And she did. It was a tough job, but switchboard sleuthing disclosed that the destination should have been Hawthorne, Nevada, U. S. Marine Supply Station. Mission accomplished. Call completed.

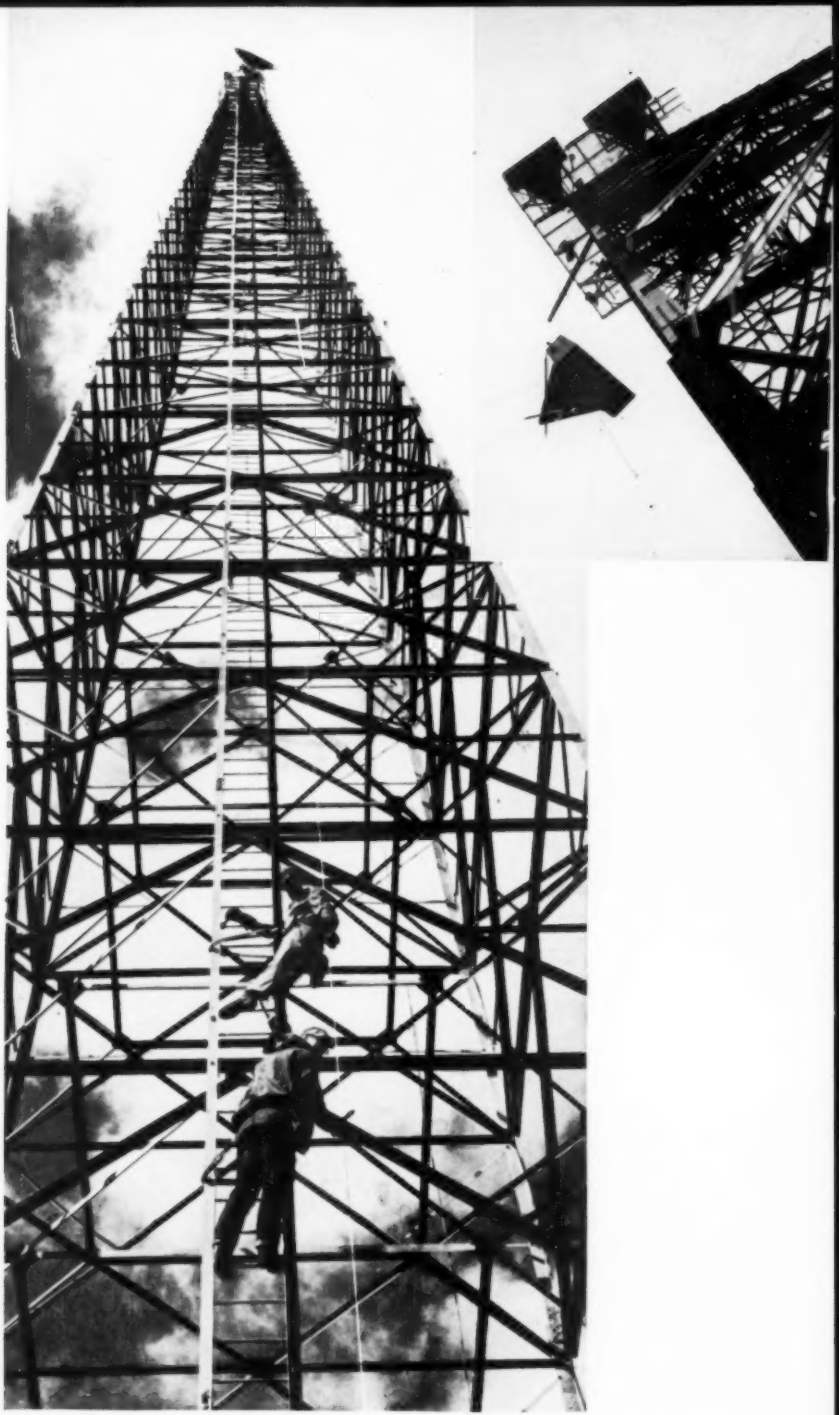
(*From an employee bulletin of the Southwestern Bell Telephone Company*)

Towers and Beams



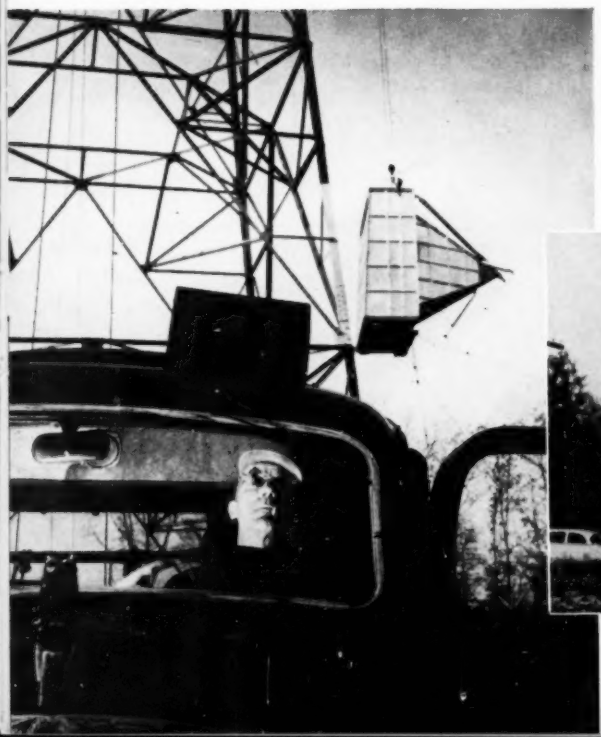
Radio relay tower and open-wire toll line both serve important routes

THE ART of communication advances—and history repeats itself. Three decades and more ago, telephone lines were being expanded to carry the newcomer, radio broadcasting, not only from coast to coast but into communities large and small throughout the nation. Now, in these still relatively early days of television broadcasting, a somewhat similar development is taking place in Bell System television program facilities—of which radio relay forms the larger part. Beamed from tower to tower across the country with the speed of light, television images as well as telephone messages are transmitted over a network which has grown to more than 60,000 channel miles of radio relay facilities in the last five years. Today the major activity is in providing extensions to the "backbone" routes, to carry the programs into more and more communities in many parts of the country. The map two pages over shows how much the network has grown—more than 19,000 channel miles—in the past nine months, and the pictures give some indication of what is involved in making these newest facilities for telephone and television service available to more people in more places. And now the art progresses further—as witness the transmission of Pasadena's Tournament of Roses parade across the continent on January 1 *in color.*



Radio relay facilities are being extended throughout the country. Above: A radio relay tower with dish antenna on top splits the sky on a recently completed route in Wisconsin. Left: A construction man gazes aloft at a tower going up in Georgia. Upper right: a lens antenna is hoisted into place atop a New Jersey tower

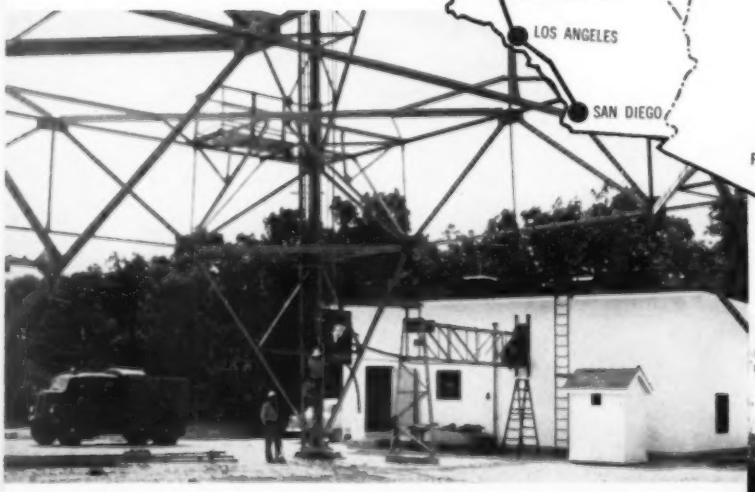
Access to radio relay equipment at the towers is essential. The road seen above was built for that purpose in Ontario, Canada, while it was possible to locate the tower at the right beside a highway in Georgia



Lens antennas are big, heavy, and difficult to handle. The truck driver is watching signals in the mirror in his truck cab as he winches one aloft. That one is in New Jersey; the array of four is in Tennessee

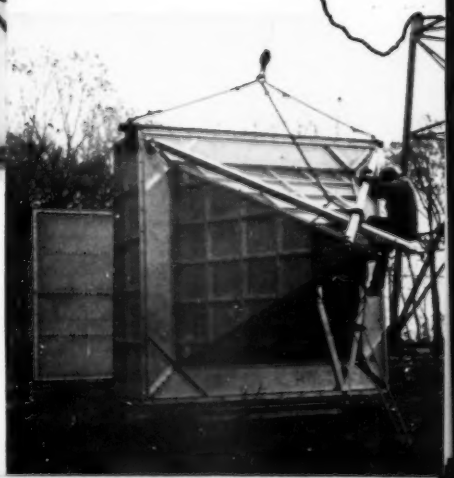
Steady hand and specialized skill

It's just as far down as it was up



Wave guides conduct the signals between the transmitting and receiving equipment housed in this building at the base of the tower and the antennas at the top

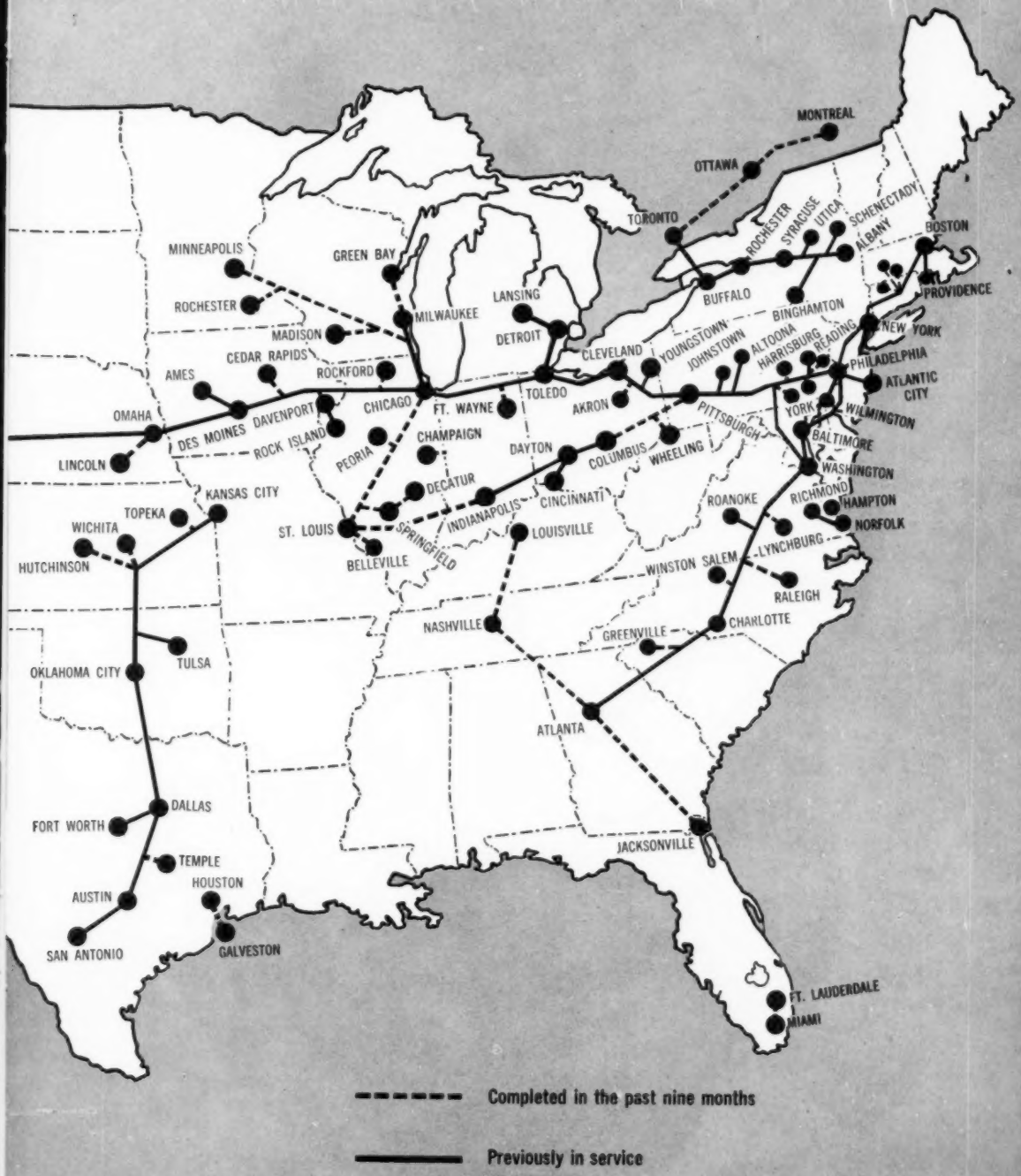
Preparing for the long swing aloft

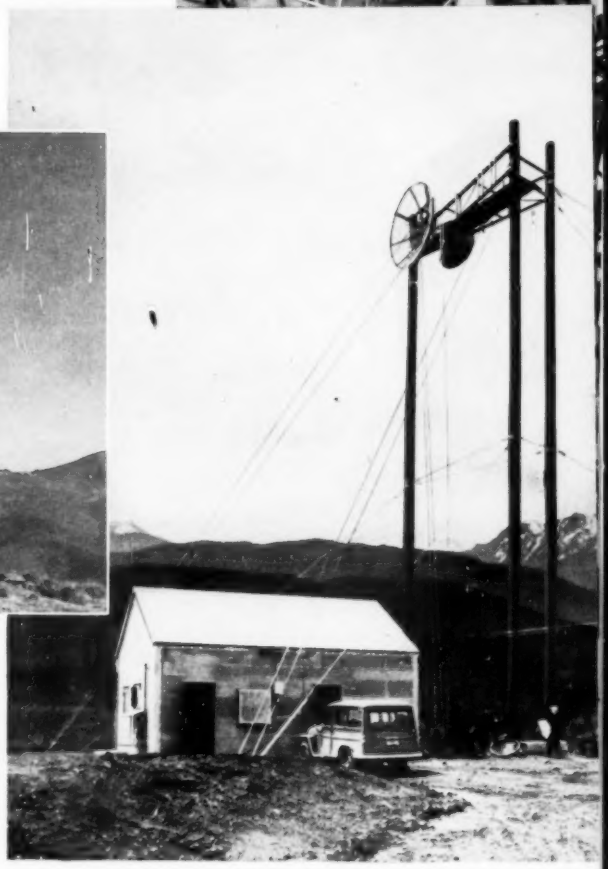


SEATTLE
TACOMA
YAKIMA
SPOKANE
PASCO
PORTLAND
SACRAMENTO
SALT LAKE CITY
DENVER
SAN FRANCISCO
FRESNO
BAKERSFIELD
LOS ANGELES
SAN DIEGO
MESA
PHOENIX

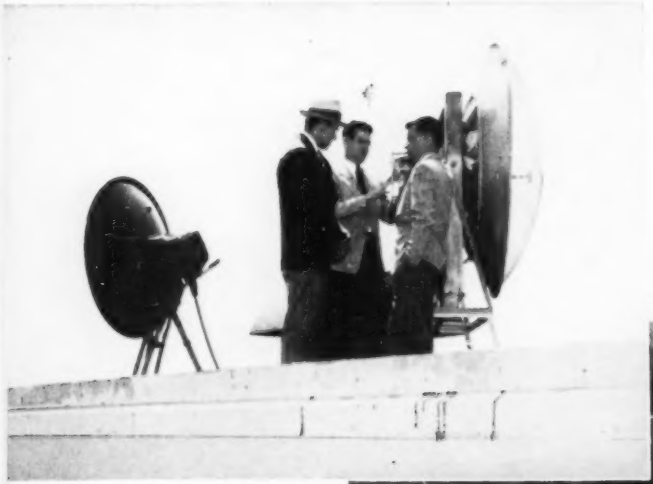
BELL SYSTEM BROAD BAND RADIO RELAY ROUTES

December, 1953



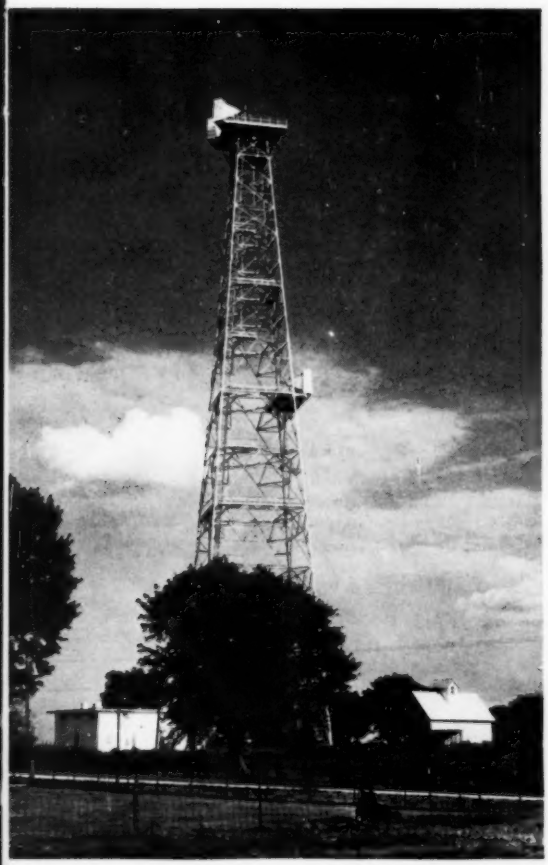


This radio relay station for rural service handles telephone calls to and from an isolated industrial enterprise in Nevada. The station at the right, on Mt. Blyn, Wash., speeds telephone calls across the waters to Victoria, B. C., replacing submarine cables

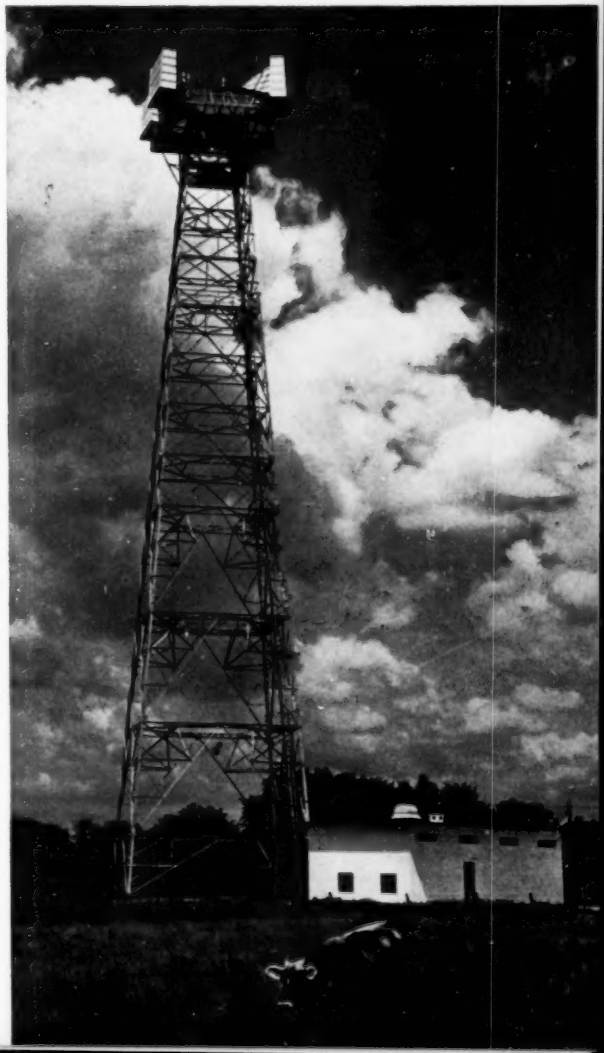


Left: Temporary arrangement of radio pick up equipment in Boston for transmission of motion pictures, flown from England, of Queen Elizabeth's coronation. Below: Portable radio apparatus on a roof-top in New York City

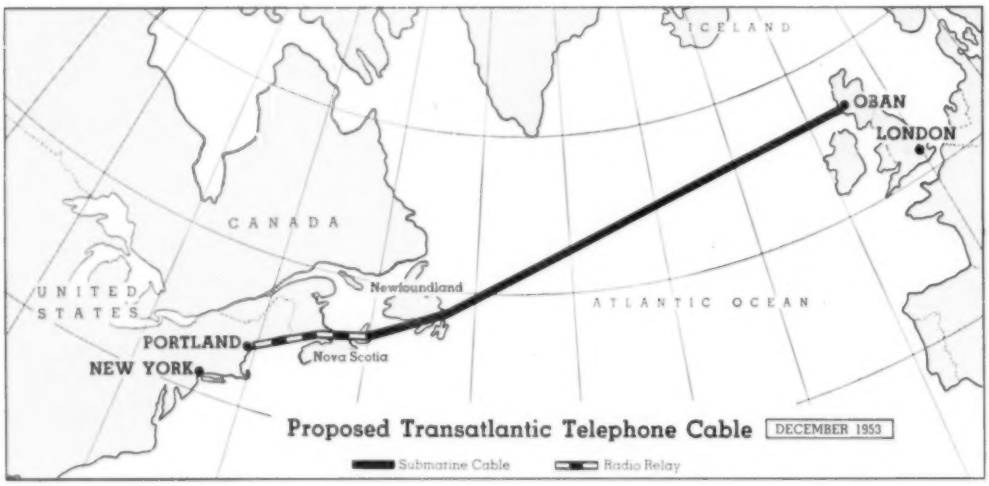
Tower and antennas appear through a frame of foliage



Antennas on different levels are sometimes needed to avoid reflection of signals



They stretch their spidery framework to the sky



Transatlantic Telephone Cable Planned

THE LONG LINES DEPARTMENT of the American Telephone and Telegraph Company announced plans last December 1 to construct the first telephone cable system across the Atlantic. The transatlantic portion of the system, with its many built-in vacuum tube repeaters, will be 2,000 nautical miles in length and will be laid in depths up to three miles on the ocean floor between Scotland and Newfoundland. It will then connect with another submarine cable extending 300 miles westward to Nova Scotia. From there, a 350-mile overland microwave radio-relay system will be built to carry the transatlantic circuits to the United States border, where connections will be made with the Bell System network.

The cable system will have capacity for 36 telephone circuits, with a group between New York and London and another group between Montreal and London. At the gateway cities, the circuits will connect with the telephone systems of the respective countries. These cable circuits will supplement transatlantic radiotelephone circuits, which include 12 now in regular use between New York and London as well as others to various transatlantic points.

Each deep-sea repeater employs three vacuum tubes and is housed in a flexible copper tube seven feet long and 1½ inches in diameter. This is supported by steel rings to form a structure that is built into the cable and appears as a tapering bulge. This design permits the repeaters to pass through the cable ship's gear along with the cable, so that laying will be orderly and uninterrupted. Such devices were developed several years ago and have undergone successful trial between Key West and Havana since 1950. There will be over 100 under-water repeaters on the transatlantic segment of the proposed system. The vacuum tubes used in these repeaters have been under development for years and have withstood both laboratory and underwater operating tests of the severest kind. The voice currents will travel along coaxial conductors, which will be insulated by a solid layer of polyethylene. Power to operate the vacuum tubes on the ocean bed will be fed in from both ends of the cable

(*Continued on page 248*)

The Transmission Engineer's Battle against the Two Ds, And Other Aspects of His Constant Effort to Make Talking Clearer and Cheaper—as Explained by One of Them

DB Rampant on a Field Of Azure

Harold R. Huntley

EVERY Bell System company harbors a group of uncommon folks who are known as transmission engineers.

To all outward appearances these transmission engineers are normal human beings. They are practically indistinguishable from the rest of humanity except for one thing: when they are working—and only when they are working—they talk a different language from the rest of the human race. At other times they talk what passes for English, and you can only get a clue to their working language if you ask one of them to explain to you what he does for a living. I recommend against it.

These poor fellows continually rebel against this language barrier and they are continually trying to make other people understand what they are talking about because, you see, after all, they *are* human and they don't like to be shut off from communication with their fellow man, particularly since communication is their business.

By this time you must have surmised that the reason I can talk so authoritatively about these peculiar people is that I am one of them. This article is just one more attempt of a long line of such attempts my fellow transmission engineers and I have been making to try to tell what transmission is, where we have been in this field, where we are now, and some of our hopes and aspirations for the future.

What Transmission Is All About

THERE IS a general impression among us in the telephone business that the principal reason for a person's making a telephone call is that he wants to *talk* to somebody else. If this impression is correct, then how well people can talk on a telephone connection is a very important part of the telephone business. And the

". . . as a matter of course . . . you had to shout"

things that affect how well people can talk over telephone connections are an important part of transmission—and transmission is what transmission engineers work at.

Now people in general have two peculiarities which are very important in connection with this talking business. For one thing, they always want something better than they have now. If it were not so, we would all drive our automobiles till they were no longer serviceable; as a matter of fact, there probably wouldn't be any automobiles—perhaps not even a "surrey with the fringe on top."

In the second place, they want to get their money's worth—and, if possible, a little to boot.

And so it is with transmission. Thirty years ago, only in an emergency would you even have thought of trying to call your cousin who has a chicken farm just outside of Petaluma, California—unless you lived in or near Petaluma. And, if you did call, you would have taken as a matter of course the fact that you had to shout. Fifteen years ago you would have tried it on much less provocation; and, if you had a good, clear conversation, you probably would call up the telephone manager and confide to him that maybe the telephone was here to stay after all. Now you don't even have to have a good reason to call; and if you don't get a bang-up talk—!XX*-!X!XX???!! And 25 years from now you will probably expect a bang-up talk without even having to lift a handset.

Along with improved service, talking must be kept a bargain. And it can't be a "luxury" sort of bargain—excellent if one can afford it. It must be such a good bargain that everybody can afford it and think he is getting his money's worth—and then some.

This, then, is what transmission is all about: to provide the ability to talk easily on a wide variety of connections; to continually improve this ease of talking as time goes on; and to keep it a bargain.

How Transmission Work Is Done

THE TRANSMISSION ENGINEER works with many complex tools, but his over-all concern is with two things: DBS and dollars. And therein lies his language difficulty.

The dollar part of his language is easy to understand; everybody knows—or thinks he knows—about dollars. Dollars are nice things to have coming in but bad things to have going out.

The DB is another thing. Later on I will attempt to tell something about

DBs, but let's put off this agonizing job as long as possible. For the moment please be content with the statement that the fewer the number of DBs in your connection, the better you can talk.

If the transmission engineer could forget about the dollars and think only of the DBs, his life would be very simple and he really wouldn't care whether or not new things were developed or whether or not anybody understood him. For example, if dollars didn't count, the transmission engineer would simply add enough copper to his circuits to make them talk the way he wanted them to. It is true that for transcontinental circuits he would have to use enormous conductors, and he probably would have a little difficulty spanning the oceans, but at least for the shorter circuits he could trade dollars for DBs very successfully.

But his problem is not that simple. He has to get more and more of the DBs out because people always want something better; but he has to be very careful about how many dollars are put in, because people are not going to place many calls if they cost too much.

So our transmission engineer fights his battles against the two Ds—dollars and DBs. And he has been reasonably successful in the past: not so successful that he can rest on his oars, but successful enough so that he is optimistic about the future.

His greatest success has been in talking over long distances. In this field he has greatly improved the transmission and he has beaten the price rise. No longer is talking from, say, New York to San Francisco a struggle to see how loudly and long one can shout and how acute one's hearing is—one just talks and listens naturally. And one can talk on such a connection for three minutes for $2.50, whereas 30 years ago it cost him $16.50.

Now, talking over 3000-mile distances is glamorous, and nobody can deny that the transmission people have been pretty successful at it. But there's a lot more to this transmission business. People also want to talk over 300-mile and 30-mile and 3-mile distances. In fact, for every 3000-mile call there are at least a hundred 30-mile calls and thousands of 3-mile calls—and therein lies the present and future transmission problem, at least for the next few years.

So while our transmission engineer keeps a weather eye cocked on the long-haul end of the business, he is pretty well preoccupied with his struggle in what we call the "short-haul" end of the business. This short-haul business is tough: DBs come out only with great difficulty but dollars can go in very easily; there is no glamour in it, and it doesn't make the headlines. He has not been able to beat the price rise in this part of the business; the best he has been

"Now you don't even have to have a good reason to call"

able to do is to keep the cost of the circuits from going up as rapidly as prices in general have risen.

But if the problems are great, the stakes are even greater, just because there are so many calls of this variety. Let's look at this matter of length versus dollars more closely.

The Shorter the Tougher

IN ORDER to get the right perspective on this short-haul problem and how we believe it will be solved eventually, I am going to have to get close—but not dangerously so, I hope—to the cage marked "Danger—DBs—do not disturb or attempt to feed." And in doing so, I am going to go back to a couple of fundamentals.

In the days before electronics, it was generally true that the longer the circuit the *more it cost per mile,* if it were to give the same performance. To illustrate: a circuit, say, 10 miles long had to have wires of a given size to produce not over a desired number of DBs in the 10 miles. Now if we wanted to go 20 miles, we obviously would have to have wires twice as long but, in addition, if we wanted to have the same number of DBs as in the 10 mile circuit, the wires would have to be about twice as big. Thus, to keep the same performance at twice the length, we had to use four times as much copper (twice as much per mile times twice as many miles).

In the electronic era the reverse is in general true for everything but the very short circuits, say, up to five or ten miles. That is, the longer the circuit the *less it costs per mile* for equal performance. And this requires a little explaining.

In this era, the transmission engineer no longer uses the brute force method of putting more copper in to get DBs out. He uses electronic amplifying and carrier gear. Thus:

1. For the circuits of moderate length he can use as small wires as he wishes and can offset the DBs thus added by taking out DBs by means of amplifiers.
2. For the longer circuits, he uses carrier,* which divides the cost of the base plant —the pole lines, the cables, the wires, the radio systems, etc.— among many circuits.

Once he has done this, the costs per circuit of the base plant are reduced and he can take out as many DBs as he

". . . fights his battles against the two DBs*—dollars and* DBs*"*

* See "Carrier Is King," MAGAZINE, Winter 1949–50.

wants to by turning knobs (with some limitations which are too abstruse to be discussed here), and operation with only a few DBs in the circuit doesn't cost any more than operating with lots of them. (A parallel is your own radio set. Once you have bought it, your power bill is not affected by where you set your volume control knob).

Thus, once the proper electronic equipment is added to a circuit, there is no longer any fixed relation between the DBs and the dollars in the circuit; the DBs and the dollars are affected by different things.

If this be true, then why does the dollar problem get tougher as the circuits get shorter? Simply because the electronic equipment costs money. And it is obvious that if one is to have fewer total dollars in his circuit, he must save more in base plant costs per circuit than he spends for the gear he adds.

Now, the major cost for the equipment he adds is at the *ends* of the circuits, while the base plant cost savings are on a per-mile basis. So, if the circuits are long, the base plant cost savings are big, and more than offset the costs of the terminal gear. As the circuits get shorter, the base plant savings get smaller, and, since the costs of the terminal gear do not go down proportionally, the total cost per mile go up.

In summation, then, the problem of getting low dollars and DBs per mile gets tougher as the length of the circuits decreases. But because of the high stakes, our transmission engineer has set his sights on overcoming these problems even though they seem inherent. And he sees over the horizon ways of doing it.

". . . sees over the horizon ways of doing it"

He may not see these problems licked in his lifetime, but he is confident that some future generation will.

Why?

How To Do It

ALL THAT IS NEEDED to solve the short-haul problem is to get the costs of making and using amplifying and carrier and radio equipment down much lower than at present. And our transmission engineer believes it can be done. Here are his reasons.

In our economic system there is a base cost below which we cannot get. This cost is the cost of the raw materials which go into what we make.

But aside from a few things like coal, crude oil, etc., the final cost of a product is largely determined by the cost of fabricating it, handling it, and putting it to use. For some highly precise products—like, for instance, a fine watch movement—this cost may be hundreds or thousands of times the cost of the raw material. Electronic gear is also in this category.

If the cost of the finished product is hundreds or thousands of times the cost of the raw materials which go into it, there is almost unlimited opportunity for reducing costs and the only problem is how to take advantage of this opportunity. There are several ways to reduce costs

under these conditions: one of them is quantity production, another is skill born of long experience, another is new materials, and still another is sheer brains and ingenuity.

Our transmission engineer knows that as he applies electronic gear to shorter and shorter circuits, the quantities involved will be much greater than have ever been used before and this fact alone will reduce the costs.

He also realizes that while the electronic business is not an infant any more, it has not reached the full stature of manhood and there is still much to be learned about how to use it to the best advantage. He knows, therefore, that as he goes ahead he can improve his skill in integrating electronic equipment into his plant and that this will also enable him to get better results for fewer dollars.

Materials, Ideas, Organization

AND WHILE he doesn't see anything in the way of new materials as revolutionary as the vacuum tube was when it came on the scene, he does see many things which may well be as important in total as the vacuum tube in keeping DBs and dollars down. For example, there is the transistor, which bids fair to open a whole new field of miniaturization—which will make the gear cost less and will let him house large numbers without breaking the bank for new buildings and power plants. There is a new series of magnetic materials known as "ferrites" (they are ceramics made up of iron rust and other common ingredients suitably treated) with which to make smaller, cheaper, and better magnetic cores. There are new materials which can be used to make smaller, cheaper, and better capacitors. There are . . . . but why go on?

But above all, there are new ideas: new applications of brains and ingenuity which may and probably will radically change the design and application of electronic gear. I cannot possibly take the space to describe them, but, for what it is worth, a few of them are negative impedance amplifiers, mechanical filters, magnetic and capacitive amplifiers, etc. etc. etc.

And our transmission engineer does not stand alone in working out his destiny. He has an organization in New York—the O. & E. Department of the A. T. & T. Co.—to whom he can tell his needs and his aspirations and a large part of whose responsibility is to translate these needs and aspirations into the general kinds of things which need to be invented and made. In back of the O. & E. Department is the Bell Telephone Laboratories, a large part of whose job is actually to invent specific things that are needed—or use somebody else's inventions—and to develop them for manufacture. And then he has the Western Electric Company, whose job it is to make—or have made—the things which have been invented.

He sees himself, then, as a member of a team which has solved many tough problems in the past and which he is sure can and will solve the tough problems of the future. With such an outlook, how can he help but be optimistic?

Now you know all about transmission except for the DB.

And, if you have read this far you are in one of three groups:

1. You don't know what a DB is and you don't care.
2. You don't know what a DB is and you'd like to know.
3. You know what it is.

Groups 1 and 3 should stop reading right now, because the rest of this is directed solely to Group 2.

Why Is a DB?

SOMEONE has said that the only things we know are the things we can measure. And so in transmission we must have some method of measuring how much speech loses or gains as it goes over a circuit. The measuring stick we use is called the DB. (In the accompanying box there is a brief description of the DB and how it got its name.)

Now the thing that makes the DB hard to understand is that it is tied to "ratios"; that is, a given number of DBs means a given *ratio* of powers. This is different from most measuring sticks which we use, since they are in absolute terms and are what the mathematicians call "linear." Let me illustrate the difference between a DB kind of measuring stick and the linear kind of measuring stick.

Dollars are a familiar commodity measured on a linear basis. $2 will buy twice as much as $1 (at least approximately). But imagine, if you

THE DB

The term DB is an abbreviation of the coined word "decibel." A decibel is one-tenth of a bel. The mathematical expression is:

$$\text{DB} = 10 \log_{10} \frac{P_2}{P_1}: \text{ where}$$

$\frac{P_2}{P_1}$ is the ratio of powers being compared.

The name bel was derived from the name Alexander Graham Bell, the last "l" being left off to avoid confusion with other uses of the name Bell. The reason that decibels are commonly used rather than bels is that the bel is an inconveniently large unit and using it would be something like measuring the size of a rug in miles instead of feet and inches.

The DB is the latest of the series of units which have been used in the past in measurements of transmission.

Many years ago the transmission unit was the so-called "mile of standard cable" (which was roughly the same as a mile of 19 gauge non-loaded cable pair), and the transmission loss of, say, a piece of equipment was measured by comparing it with the number of miles of standard cable which would produce the same over-all effect on speech.

The next step was taken when testing instruments were developed which could be used instead of talking tests. The unit then used was the loss of a mile of standard cable at the specific frequency of 800 cycles and it was usually known as the "800-cycle mile."

Still later, the measuring unit was divorced from any particular type of plant and was based on power ratios. This unit was called a "Transmission Unit" and abbreviated TU. The DB has the same magnitude as the TU. Adopting the DB, therefore, required only a change in name.

Sometimes the DB is applied to voltage or current ratios—in which case the formula is changed. However, this is permissible only under certain conditions and should be attempted only by an expert.

will, that we were in a peculiar sort of economic system in which the purchasing power of dollars went up or down not directly but as some other function. It might be, for example, that if $1 would buy 1.26 units of something or other, $2 would buy $1.26 \times 1.26 = 1.58$ units and $3 would buy $1.26 \times 1.26 \times 1.26 = 2.00$ units; and so on. (If you look at the DB table you will see why I picked this particular scheme with 1.26 units as the starting point, and how we could reconstruct this table by this kind of process.)

While such a method would look pretty silly applied to dollars—or inches, or bushels—it is exactly the plan that has to be applied in measuring transmission.

Why? Aren't we in the business of transmitting electrical power to a listener's receiver? And, if so—and we are—why don't we use the ordinary method of measuring the amount of power we transmit and deliver; that is, why don't we use watts just as a power company does?

One of the answers is that while we are in the business of transmitting electrical power to a listener's receiver, we do not generate the power which we undertake to deliver. This power is generated by a talker at the other end of the connection, and our job is to deliver enough of it to the listener so that the sounds which come out of his receiver are loud enough so that he hears clearly. We do not know how much power there is to start with in any particular case, because talkers vary tremendously in the amount of power they put out, so that there is not much sense in trying to measure it in the same terms as the power company does in measuring the power which they send out from a generating station. (Incidentally, your telephone bill would look peculiar, to say the least, if it read $—— for —— watt-hours for a call to Petaluma, Calif. You see, we are not interested in the power as such—we are only interested in its ability to carry information. You may not even be interested in the information—but that's beside the point.)

So what our transmission engineer is concerned with is delivering to the listener a large enough proportion of the power which the talker puts out so that the listener gets good, clear sound out of his receiver. In other words, he is interested in the *ratio* between the power he delivers to the listener and the power the talker puts out. It's as simple as that.

IT ALSO HAPPENS that the laws which nature has set up to govern what happens to power when it is transmitted over a circuit also work on a ratio basis; that is, the effect of two things connected in tandem is the product of the effects of each of them individually. This is another reason why we use ratios as a fundamental in telephone transmission.

Now I still haven't told you why we use DBs instead of ratios about which I have said so much. I will let you in on a secret. In spite of all the scientific hoopla about the DB, all it is is just the lazy—excuse me, efficient—man's way of handling ratios. And the reason why it is easier to use DBs rather than the ratios themselves is that by using DBs one can add instead of having to multiply. For example:

A certain kind of cable has a loss

of 1 DB per mile. Looking at the table, we find that the power ratio of 1 DB loss is .794. Now, using DBs we find the loss of 6 miles of this particular cable as follows:

$$1 + 1 + 1 + 1 + 1 + 1 = 6 \text{ DB}$$

Now, looking at the table again, we see that a power ratio corresponding to 6 DB is .25. We could, with sufficient effort, obtain the power ratio for 6 miles of this cable, using ratios directly, as follows:

$$.794 \times .794 \times .794 \times .794 \times .794 \times .794 = .25$$

See what I mean?

The fact that a given number of DBs means a particular ratio of powers and not any absolute value of power like, for example, a kilowatt is so fundamental that I can't resist another example or two.

Let's get out of this electrical business and talk about dollars again because, if we want to, we can apply DB to dollars as well as to transmission.

Suppose you have $1000 and I have $250 and let's assume that the purchasing power of this money is directly proportional to the number of dollars. Then your dollars are 6 DB above mine because a ratio of 4 to 1 corresponds to 6 DB. If you had $10,000 and I had $2,500, you would still only be 6 DB ahead of me, because the ratio is still 4 to 1, even though the absolute number of dollars difference is 10 times as big ($7,500 against $750).

Now sometimes we do know a starting point, so that we can say: "So many DB up or down" from this starting point. (Which means such and such a ratio to the quantity with

DB TABLE

Below is an abbreviated table of power ratios versus DBs:

Number of DB	Power Ratio Loss	Power Ratio Gain
0	1.00	1.00
.1	.977	1.02
.2	.955	1.05
.3	.933	1.07
.4	.912	1.10
.5	.891	1.12
.6	.871	1.15
.7	.851	1.17
.8	.832	1.20
.9	.813	1.23
1.0	.794	1.26
2.0	.631	1.58
3.0	.501	2.00
4.0	.398	2.51
5.0	.316	3.16
6.0	.251	3.98
7.0	.200	5.01
8.0	.158	6.31
9.0	.126	7.94
10.0	.1	10
20	.01	100
30	.001	1,000
40	.0001	10,000

The man who works with transmission uses more elaborate tables than this one, but this will give an idea of how the DB works. Note particularly that every 3 DB approximately doubles a number (or cuts it in half) and every 10 DB adds a zero to it (either in front or in back).

Note also that adding DBs produces the same effect as multiplying the corresponding power ratios. For example; 3 DB + 6 DB = 9 DB and .501 × .251 = .126 which is the power ratio corresponding to 9 DB.

Note also that a given difference in the number of DBs has the same effect regardless of where one starts. For example: going from 0 to 3 DB cuts the power in half (or doubles it); going from 3 to 6 DB does the same thing; so does going from 7 to 10 or 997 to 1000.

which we started.) When we do this, we almost always put a letter following the DB like, for example, DBm (for DB from one milliwatt), etc. (Sometimes we do not put such a letter because, after all, we have to keep *some* secrets to ourselves in this business.)

Now when we do this, our starting point is 0 DBm or 0 DBx, or 0 DB—whatever else we use, and this starting point corresponds to one unit. Thus 0 DBm means 1 milliwatt. And + means greater and — means less. Thus + 6 DBm means 6 DB more than 1 milliwatt, which by our table is 4 × 1 milliwatt or 4 milliwatts. Likewise 120 DBm is 120 DB more than 1 milliwatt and this is a trillion milliwatts or a billion watts or a million kilowatts—anyway, it's a lot of power. And — 6 DBm is 6 DB less than 1 milliwatt, which by our table is .25 milliwatts.

Maybe I can illustrate this by again using dollars. Assume that our starting point is $1 and this will be 0 DBd—DBd meaning DB from $1. Using our power ratio table, we can say something like this:

Up		Down	
DBd	Dollars	DBd	Dollars
0	$1.00	0	$1.00
+ .2	$1.05	− .2	$ .96
+ 1.0	$1.26	− 1.0	$ .79
+ 3.0	$2.00	− 3.0	$ .50
+ 10.0	$10.00	− 10.0	$ .10
+ 100	$10,000,000,000.00	− 100	$.0000000001

As this table illustrates—if you haven't discovered it by this time—the quantities associated with — DBs are the inverse of the quantities for + DBs, and vice-versa. Also, as this table shows, we often can get rid of cumbersome figures by using DBs; as, for example, using 100 DB instead of having to write 1 with 10 zeros after it.

I cannot resist one more example of how DB works. You probably know the ancient and honorable story about the guy who had the nerve to ask the ruling mogul for his daughter's hand. The mogul readily assented, provided the guy would put one grain of wheat on the first square of a checker board, two on the second, four on the third, eight on the fourth, and so on, doubling the number of grains each time. Doubling the number, of course we know by now, means about 3 (precisely 3.0103 . . .) DB. However, this was in the days before DBs were invented, or maybe the guy was not a transmission man, else he would have known long before he started that he was due to get licked. So, in his ignorance he went off to get some wheat. The first row was easy. On the first square he puts 1 grain, which we will call 0 DBg (DBg meaning DB from one grain). The second square gets about 3 DBg, the third 6 DBg,

. . . on a field of azure

and so on. The eighth square gets about $7 \times 3 = 21$ DBg; 128 grains. (If you don't believe this, multiply it out; it is $1 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$). The second row is not too bad. The 16th square gets about 45 DBg, which is close to 32,000. Let's cut the agony short. The 64th (and last) square must have about 3×63 DBg $= 189$ DBg—which is about 8 billion billion (i.e., 8 with 18 zeros after it) grains of wheat. Now even without counting what was on the other squares, that's a lot of wheat—probably more than there was in the world at that time and maybe even now. Anyway, even if the guy could get the wheat, before he could count out 8 billion billion he would be too old by a billion years or so to be worried about gals.

So now you know all about the DB.

You also know all about transmission. And you understand how the DB fits into the transmission business and how the transmission business fits into the telephone business. And perhaps you can better appreciate why it was, before you knew all of these things, that you had so much difficulty understanding our transmission engineer when he tried to tell you what he was driving at and how he was faring in his battle against the two Ds.

Postscript

LIKE Humpty Dumpty in "Alice In Wonderland" (or is it "Through The Looking Glass"?), words mean what I choose them to mean.

And here's what I choose the words in the title of this article to mean.

The "DB" part I have already described. The "rampant on a field of azure" part I choose to mean: that combination of imagination and sweat—of keeping one's eyes on the stars and his feet on the ground—which must characterize the work of the transmission engineer if he is to continue to integrate the new things with the old in such an efficient manner that the service keeps getting better year by year and is always a bargain.

The Head of the Illinois Bell Company Addresses American Society of Safety Engineers on Their Important Part in the Country's Accident Prevention Program

Functions of the Safety Engineer in Industry

William V. Kahler

SAFETY ENGINEERING and accident prevention are subjects in which I've been very much interested for some time—although I'm sure you experts know a lot more about them than I. I suspect, however, that the main reason I'm here is that the Bell System has received the National Safety Council's Award of Honor for two years in a row—and we're certainly proud of it. However, we feel it's only a step in the right direction.

For many years we at the telephone company have had a creed that says "No job is so important and no service is so urgent that we cannot take time to perform our work safely." Now I grant you, that sounds like a slogan. It's meant to. But we look upon it as a basic human concept, backed by engineering principles. It has become our policy.

We have some 157,000 Plant men spread out across the country. They are engaged in engineering, construction, installation, and maintenance activities. These men operate trucks, derricks, diggers, plows, tractors, and other heavy power equipment, all of which present, to the untrained, a substantial exposure to accidents. They also use a variety of light power tools. They climb poles. They come in close contact with winches, cables, and high-voltage wires. Much of their work is done on busy streets or along highways, in all kinds of weather. They have to clear fallen trees and restore lines during floods and windstorms and in sleet and blizzards. The nature of the telephone business is such that we must give prompt and dependable service, not only under normal conditions but under urgent and emergency conditions as well.

I mention these things merely to illustrate that there are some potential hazards in our business—much like those in many other businesses.

I mention them, too, to illustrate that, while we have a policy that cautions our people to take time to do their work safely, nevertheless, we must often work against time. These two situations would, offhand, appear to be in conflict with each other. But I assure you they are not. I can give you an example that proves my point:

On a winter night a few years ago, fire destroyed one of our exchange buildings just outside Chicago and 10,000 telephones, in an area of 50,000 population covering five suburban towns, went dead. Normally we would have taken a year or more to build and equip an exchange of that size. But 11 days later, complete service had been restored. Hundreds of men worked around the clock on that restoration job, and under most adverse conditions—including zero weather and a blizzard. But the job was completed without a single personal injury—and with a level of individual and team morale that couldn't possibly have been better. We proved that safety and speed can be combined—and *both* win.

Safety and Service Together

OUR APPROACH to safety is, I think, a simple and direct one. We combine accident prevention with our effort to maintain service. Safety is accepted as a part of the planning of every job, as part of the training of those who do the job, and as part and parcel of the supervisory philosophy that guides our people on the job. Stated another way, the principles of our program, for both men and women, are:

The Bell System is proud to have won the National Safety Council's Award of Honor for two consecutive years

An awareness and ferreting out of the inherent hazards that go along with daily living and working.

A continuing and thorough education in how to use, safely, the tools and equipment peculiar to our industry.

An effective safety leadership in all levels of supervision.

One of the first steps in our safety program is to try to anticipate any job dangers that exist. This is accomplished through the written detailing of almost every mechanical job we do, so that hazards of the job are exposed and avoided. When we give men and women employment, we feel they have a right to expect

us to point out any hazard they're likely to face in any operation they're asked to perform. We also feel they have a right to expect us to train them to avoid hazard when it exists. We regard it as management's responsibility, up and down the line, to create in the minds of employees a genuine desire to work safely.

Then we try to engineer safety into our tools, our plant, and our work methods. The safety engineering concept is folded into all of our operations and training procedures.

It seems to me that there's been a tendency to think of accident prevention almost solely from a humanitarian standpoint, with too little regard for its engineering aspects. I believe this accounts for the slow progress, until recent years, in accident prevention in industry. Every complex mechanical contrivance in use today—whether it be an automobile, a telephone system, or almost anything you can name—had its beginning in a simple machine. And development to its present state has been possible only through the application of scientific knowledge and engineering principles as they become available through research and development. I can think of no reason why scientific knowledge and engineering principles should not be similarly applied to accident prevention. Engineering, after all, is essentially the constructive use of accumulated experience. And so it is with accident prevention.

Service in the River Grove, Ill., central office was completely restored in eleven days after it had been gutted by fire—and without one personal injury

The objective of safety engineering, as I see it, is to find out how and why accidents happen and what has to be done to prevent their recurrence. I'm sure all of you safety experts know there's really little that is basically new in the way people get killed or injured. Most of the pain and suffering comes from the type of accidents that occur over and over again. We have the accumu-

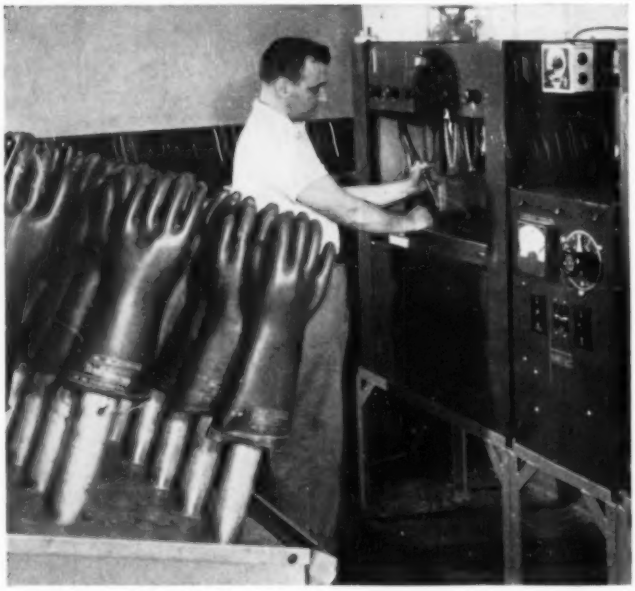
lated experience — but apparently we are not profiting from it as we should.

There is, however, ample evidence that this engineering concept is gaining a wider acceptance in industry. I'd like to cite one or two examples which are probably already known to you:

In 1945 the major automotive companies, machine tool builders, and industrial equipment users got together to discuss improved methods of building and installing electrical, hydraulic, and pneumatic components on machine tools. The standards that resulted from this coöperative effort were not something the law required. They came about through the initiative of private industry. And the remarkable thing about the adoption of those standards was that, along with a better safety environment for employees, they brought gains by way of uninterrupted production, longer equipment life, and reduced equipment maintenance.

"*. . . they have a right to expect us to train them to avoid hazard . . .*"

In another specific case, an automotive plant had several hundred large presses that were loaded, unloaded, and operated by hand. To eliminate the possibility of amputation, the company adopted a policy of prohibiting any part of the operator's body being put between the punch and the die. Dies and other equipment had to be redesigned—which was costly. This company's primary objective was to protect its employees. And in this it succeeded —for the change brought a decided improvement in the plant's safety record. But it also brought increased production and a decrease in scrap. By keeping arms, fingers, and hands out of the danger zone, it was found that presses could run continuously instead of intermittently. Efficiency was increased, costs were cut. Again, what started out to be only a matter of making the job safer turned out



Lineman's rubber gloves are tested to 10,000 volts by the Western Electric Company, the Bell System's manufacturing and supply unit

to be a matter of good business as well.

It's not enough, of course, to have safe practices. Just as important is having folks assigned to a job understand safe practice and *know* the job's danger points—and then training them to perform the job in a safe manner. Training and safety are interwoven. The basis of our whole philosophy in the Bell System is that the *safe* way to do a job is the *right* way.

Then why do we continue to have accidents? It is not because of any failure to engineer safety into the job but rather, in my opinion, because of uninspired attitudes. It is possible to cause spectacular improvement in safety results by working on attitudes—by promoting a real consciousness of safety. This was principally the approach utilized in some results I'm going to cite. It proves it works for women too —women working in office environments — and we found out that we don't have to be experts in female psychology to get results. (I take it the safety expert has to be a journeyman psychologist, a salesman, an engineer, all in one.)

In 1946, the accident rate in one group of women employees in our Company, mostly switchboard operators, was ten per one thousand employees. A program of stressing the environmental aspects of safety—of making this group aware of daily hazards through *participation* in committees discussing accident occurrences —was inaugurated. The result: during the last four years, the accident rate of ten per one thousand has dropped to .65 accidents per thousand employees. Each year 90 women employees in this group, or between 300 and 400 for the four-year period I mentioned, have been saved pain and suffering as a consequence of this coöperative effort.

Basically this job of selling a safety attitude was done by good supervision inspired by top management suggestion. And good supervision, with respect to safety or anything else, consists of understanding and working harmoniously with people—the same elements that produce good service.

Supervision and Leadership

THE AIM of good supervision in safety activities is always to provide positive and effective leadership so that the group will want to work safely and respond coöperatively toward eliminating accidents while at work. At the telephone company, we feel that safety training is one of the supervisor's most important duties—from the president right on down through all levels of the organization. In short, the supervisors of the supervisors are expected to be always on the alert to promote safety. Our top supervisors—in fact our entire staff—are schooled to believe that a *safe* worker is the *best* worker.

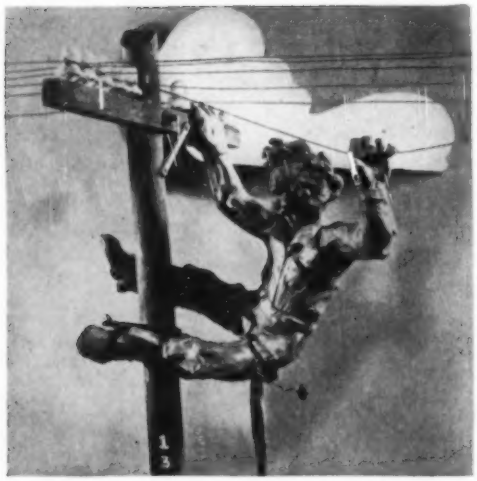
Now the causes of haste, carelessness, abstraction, forgetfulness, or poor attitude—all behaviors which may lead to accidents—can be known to a supervisor if he or she is wise and observing enough to build a solid foundation of understanding with each of his or her people. By recognizing these human behavior factors before they cause accidents, supervisors can devote their efforts to *preventing* accidents rather than to making reports of them after they occur. It doesn't do much good to tell people that they must have a safe attitude. A correct attitude toward safety must be built into them by a series of satisfying, helpful, everyday observations and suggestions, persuasively passed along by supervisors at all levels.

On the other hand, a person may be taught how to do a job safely and wind up doing it unsafely tomorrow. Years of job experience or a careless familiarity with surroundings have a tendency to cause some people to develop contempt for a practice that has come to appear tedious to them. To minimize this tendency, our training aim is not only on *how* to do a job, but *why* it must be done that way. And then, by repetition, fix details of a procedure so firmly in people's minds that it becomes habit-forming—so habit-forming that they will rebel against doing it any other way.

Safety Observation Plan

A VERY important step in our safety program is a sort of check-up. For

Testing the holding power of a strand puller, an essential tool for tensioning cable supporting strands, at Bell Telephone Laboratories



"Bill Spec" (above) and "Miss Haps" (below) are frequent reminders to employees of the need for constant vigilence

a long time the Bell System checked work quality, such as the installation of a telephone, by inspecting the job after it was done. That procedure was all right as far as it went. It enabled the foreman to find out whether all physical work was done that should have been done and in a workmanlike manner. But it left out one very important thing: it didn't tell him *how* the job was done, or whether the man worked safely and efficiently while he did it.

We improved on this "quality" inspection some years ago when we introduced what we call the Safety Observation Plan. This plan provided not only "quality" intelligence, but "safety" intelligence as well. Under this new plan, supervisors directly responsible for the safety of their men make observations of work while it's in progress. These observations cover the use of tools, material, and equipment. They are directed toward the detection of any unsafe work procedure followed in performing the work—including job planning in the light of circumstances and conditions surrounding the particular job being done—all with a view toward uncovering any failure to recognize accident potentials. When the supervisor observes an unsafe work practice, he discusses it with the man involved. If necessary he reviews with the man the written details that cover the job being done. He makes a record of the unsafe practice and if, in his judgment, the man needs it, the supervisor gives him additional special training to correct his shortcomings. So you see, our safety training program really never stops.

Records of these observations are forwarded through lines of organization, where they're studied, summarized, and discussed at supervisory and employee meetings held at regular intervals. This information is put to practical use in several ways.

First, it is used to assist in determining the real underlying causes of unsafe habits—to help us anticipate

Posters for employees and statistical studies and brief reports of how accidents happen are parts of the Bell System's consistent approach to the safety program

dangers of the job. Then, it may suggest the need for a re-design of educational and training projects for certain groups doing certain jobs. It may call for improvement in job procedure, better safety codes, and may lead to design improvements in tools, equipment, and environmental surroundings—calling on our engineering knowledge again. It may indicate the need for additional supervisory attention on certain kinds of work, or it may call for a change of emphasis in the safety program itself.

Engineering Accident Prevention

THE SAFETY OBSERVATION PLAN is just one of the ways we're applying engineering procedure to accident prevention. It's one of our means of utilizing accumulated past experience. In short, it's safety engineering with a practical touch. We know our safety engineering has been an important factor in improving our safety performance. And we regard it as good business, because it contributes to job efficiency and operating economy. But, even more important, it helps keep our folks from getting hurt. . . .

Four years ago the Labor Management Committee of the President's Conference on Industrial Safety set forth these principles, and I think they're worth repeating here:

Accident prevention is the legal *and* moral *obligation of the employer, and management must have*

the authority necessary to carry out this responsibility.

It's the moral *and* personal *obligation of each individual employee to coöperate in the safety program.*

In unionized plants, the welfare of the employees places upon the union a moral obligation to coöperate in accident prevention within the framework of its agreed-upon participation.

I'm sure all management recognizes the soundness of those principles, and accepts their part of the responsibility for seeing that they're effectively and consistently applied. I think labor, organized or not, feels the same way about it.

And that's where you safety engineers come into the picture. I won't presume to tell you how you should go about your work; but it seems to me that one of your basic problems is to get across to top management the idea that safety cannot be considered separate and apart from the production job. This "one job" concept was spelled out most convincingly, I think, by Mr. Weiser* in his article on "The Place of Safety Engineering in Industry."

Mr. Weiser points out that industry—*any* industry—has only one job, and that the three elements of that one job are quality, quantity, and accident prevention. He goes on to say that all three of these elements spring from the same production factors: careful planning, thorough training, and effective supervision. Then he maintains that it's up to the safety engineer to search for the real causes of accidents, to tap the fountain of knowledge of past experience, to bring to management the means for tapping that fountain and translating it into effective action.

While it's true that safety engineering is one of the newer vocations aiming toward professional status, I don't think that's any reason for discouragement. I heartily agree with Mr. Weiser when he says that if you safety engineers are to find your rightful place in industry, if you're to achieve real professional status, you must do your job so well that industry will find it impossible to get along without you. You have a real selling job to do—but I think you're well on your way toward the kind of recognition your high calling merits.

From whatever standpoint you look at it—humanitarianism and morale building or as an aid to greater industrial efficiency—the importance of your function is so great that wise industry will in no sense long do without your services.

* C. H. Weiser, Plant Personnel Supervisor, Southwestern Bell Telephone Company, Topeka, Kans., and President of the American Society of Safety Engineers.

Twenty-five Years Ago in the BELL TELEPHONE QUARTERLY: *From Volume VIII Number 1, January, 1929*

Announcement of the transatlantic telephone cable reminds us that transatlantic radio telephone circuits were still being placed in service a quarter of a century ago—with elaborate ceremonies. The following is excerpted from an account of the opening of service between this country and Spain. EDITOR.

TELEPHONE SERVICE between North America and Madrid was inaugurated by conversations between President Coolidge and King Alfonso XIII on October 13. The ceremonies at Washington took place in the directors' room of the United States Chamber of Commerce. President Walter S. Gifford of the American Telephone and Telegraph Company acted as master of ceremonies at Washington, while Colonel Sosthenes Behn, President of the International Telephone and Telegraph Corporation, acted in a similar capacity in Madrid.

Addressing King Alfonso, President Coolidge said: "I welcome this added link, no less strong because it is invisible, between Spain and the United States. I believe it to be true that when two men can talk together the danger of any serious disagreement is immeasurably lessened and that what is true of individuals is true of nations. The international telephone, therefore, which carries the warmth and the friendliness of the human voice, will always correct what might be misinterpreted in the written word . . ."

King Alfonso, speaking in English, replied:

"I heartily reciprocate in my own name, and in that of Spain, the greetings of Your Excellency.

"Mr. President: I thank you for the cordial words in which you do Spain the honor and justice to recognize her outstanding services to the Americas, and I agree that we ought to expect from this new means of communication ever closer relations because of the intimate and more perfect understanding between the two peoples.

"I reiterate to Your Excellency with my salutations, the testimony of my most sincere appreciation, and extend best wishes for the peace and prosperity of the United States."

J. Reuben Clark, Assistant Secretary of State, spoke in behalf of the State Department at Washington. His greeting was acknowledged by Ambassador Ogden H. Hammond, speaking from Madrid, as follows:

"It is a great honor to be the first American Ambassador to Spain to communicate with the Department of State by means of this wonderful invention of wireless telephony, which brings Spain and the United States so close together . . .

One Executive to Another

GREETINGS were also exchanged between President Walter S. Gifford and the Marques de Urquijo, President of the National Telephone Company of Spain. Mr. Gifford said:

"Although I have been in the telephone business all my life, I confess it gives me a thrill to talk over the lines of four countries, through the air over the ocean, under the sea by cable, over the Pyrenees, and to get from you in a fifth of a second a message from the country whence Columbus started upon his momentous journey, based on the belief that the world was round . . .

The Marques de Urquijo replied:

"Thanks to the co-operation of the French Post Office, through whose territory we pass, and the co-operation and facilities of the British General Post Office with its Rugby Radio Service, it has been possible for his Majesty the King to greet the President of the United States and inaugurate the telephone service between Spain and the United States. It is also my privilege to greet you, Mr. Gifford, as President of the great American Telephone

and Telegraph Company, which company has been a constant inspiration in the development of our Spanish Telephone Company over which I have the honor to preside. May I extend to you and your colleagues my most cordial salutations."

Who's Who & What's What

(*Continued from page 191*)

The Bell System works closely with the latter organization, and is much interested in the award by Congress last year (1953) of a national charter to the National Safety Council. Mr. Kahler's first telephone job was with the Southwestern Bell Telephone Company in 1922, succeeded shortly after by one in the Engineering Department of the Western Electric Company—predecessor of the Bell Telephone Laboratories. From 1924 to 1930 he was with the Engineering and Plant Departments of the Illinois Bell Telephone Company, and from 1930 to 1937 in the O. & E. Department of the A. T. & T. Company. Mr. Kahler became chief engineer of the Chicago area of Illinois Bell in 1938. Two years later he accepted a series of government assignments which included that of director of the Bureau of Construction of the W.P.B. Returning to the company in 1943, he became assistant vice president and then general manager, State Area; vice president in charge of operations in 1946; and president of the company in 1951.

Transatlantic Cable

(*Continued from page 226*)

along the same coaxial conductor. The cable will be protected by a wrapping of copper foil, over which there will be a heavy cover of jute and steel wires.

Agreement for construction of the cable has been signed by A. T. & T., the British Post Office (which provides telephone service in Great Britain) and the Canadian Overseas Telecommunication Corporation (which furnishes overseas communications for Canada). It will be owned jointly by these three organizations. The project will take three years to complete and will cost $35 million.

I am not sure when it was that the idea of providing the best possible telephone service first became rooted in this business—in the minds of telephone people. I do know it was flourishing forty years ago, when I started, and I imagine it goes back quite a while before that. It is a wonderful idea—a necessary idea—and, as we know, it is the foundation of all our efforts.

Recently the Directors of the A. T. and T. Company expressed it this way:

"We think it all important," they said, "that we furnish the best telephone service it is in our power to provide—a service high in value and steadily improving —at a cost to the user that will always be as low as possible and at the same time keep the business in good financial health."

To me that is a good clear statement.

But the meaning is equally clear when one of us says to himself,

"On that call I did everything I could possibly have done;"

And when another says, "That's the smoothest, neatest job I ever turned out;"

Or, "Brother, we're really giving service these days, and I don't mean maybe."

Now there are no two ways about it: doing our best is demanding. It simply will not come easily. But it pays its own dividends. For it sharpens our competence. As we make a habit of doing our best, we acquire talents that we would not want to be without. And beside gaining in skill, I am sure we also gain in character—in our stature as human beings.

From an address by A. T. & T. President Cleo F. Craig to the Telephone Pioneers of America on September 19, 1953.